RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

CONTENTS

EDITORIAL:
- Government Quarterly Accident Bulletin 169
- New Uses of Reinforced Concrete 169
- Co-operation 170
- State Railroads—The Lesson of Italy.... 170
- Trade and Railroad Combinations 170
- July Accidents 171
- N., C. & St. L. Train Rules 171
- Motors on the North-Eastern (England). 172
- Central of Georgia 172
- New Publications. 173

ILLUSTRATED:
- New Electric Bridge at Velsen, Holland.. 173
- Wreck of the Interstate Draw-Span..... 176
- A Novel Method of Cylinder Pier Reinforcement 180
- Four-Cylinder Compound Express Locomotive for Bavarian State Railroads.. 185

MISCELLANEOUS:
- The New Standard Code 174
- Iron and Steel Production. 177
- Government Railroad Monopoly in Italy 177
- Accident Bulletin No. 19..... 178
- Co-operation. 182
- Galveston Causeway Plans 184
- Electrolysis of Underground Pipes..... 185
- Train Accidents in the U. S. in July.... 187
- Foreign Railroad Notes: Private Street Car in Austria; Wireless Telegraphy Tests on Bavarian Trains; Loss of Property on Siberian Railway; News Service on French Trains..... 176

GENERAL NEWS SECTION:
- Notes 53
- Trade Catalogues 54
- Meetings and Announcements 55
- Elections and Appointments 55
- Locomotive Building 56
- Car Building 56
- Railroad Structures 56
- Railroad Construction 57
- Railroad Corporation News 58

VOL. XLI., No. 9. FRIDAY, AUGUST 31, 1906.

The last Government Quarterly Accident Bulletin, reprinted in this paper, shows continued heavy totals in all the items, testifying to the enormous business now being done by the railroads of the country, to the fact that some men are inexperienced and some are overworked, and that no appreciable progress is being made in safeguarding passengers' and employees' lives and limbs. Some interesting details appear. The Adobe (Colorado) collision, in March (No. 29) killed 34 and injured 24, not 22 and 22, as reported at the time—which shows the need of official reports. The bulletin says that the operator whose sleeping led to this disaster, slept at his post *not over one minute.* The statistician speaks of the rules (which were not in force in this case) to keep train-order signals normally at danger, so as to require operators to be awake when trains pass, and to require conductors of superior trains to acknowledge meeting orders before the orders are issued to the inferior train; but rightly says that the only true measure for the prevention of such collisions as this is the adoption of the block system. In another accident in this bulletin the conductor gave to the engineman the special warning signal on approaching a meeting point, and the engineman acknowledged it; and yet he did not stop. The explanation of this breakdown of the rule is interesting. Another interesting case is collision No. 25. But the most suggestive record of the whole lot is that of collision No. 8. This was a runaway, which was due to both engineman and fireman falling asleep in their seats. These men had been on duty during the preceding 74 hours as follows:

On duty	14½ hrs.	
Off duty		4½ hrs.
On duty	14 hrs.	
Off duty		4½ hrs.
On duty	22 hrs.	
Off duty		4 hrs.
On duty	10½ hrs.	

when the collision occurred. How do the records of trainmen's hours on your road compare with this?

This bulletin makes no mention of the weakness of the smoking car, which was reported to have been a main factor in the death and injury of passengers at Boston, February 15; nor did the last preceding bulletin have anything to say about the similar circumstance connected with the derailment at Sheffield, Mo., in October, when ten passengers were killed. The habitual running of old passenger cars in the front part of heavy trains, with heavy cars in the rear, is common in all parts of the country, and is unjustifiable—except on the theory that disastrous collisions are never again to occur. Besides the positive evidence of the danger of the practice which we have in such cases as Boston and Sheffield—and at many other places during the past dozen years—we have the frequent evidence—not so positive, but equally convincing—afforded by serious wrecks of trains that are composed wholly of strong cars, in which nearly or quite all of the occupants escape alive. If it is worth while to build these strong cars it is important that the utmost advantage be secured from their use. Government investigation of accidents should not be conducted at arm's length, by correspondence, from Washington, but through competent inspectors empowered to visit and inquire at short range. The difference between strong cars and weak ones is well known in a general way, but it ought to be explained specifically, with the actual wrecks cited to illustrate the truth. The railroad companies do not boast much, even about a good thing—strong cars—when the boasting is likely to call attention to another thing which is not good—the fault which led to the wreck. Hence the need of an outside inspection.

The interesting application of reinforced concrete to strengthening an old cylinder bridge pier, described on another page, is suggestive of what the future may be expected to develop in innumerable applications of this material in ways at present unthought of, which will completely revolutionize many engineering methods now considered good practice. For example, after the successful completion of the application referred to, its originator conceived the idea of extending the scheme to the construction of new pier foundations in alluvial deposits, or of the pier entire, as the case may be, and carried the idea into execution on a bridge now being built over the Red river at Shreveport, La. A description of this bridge from the plans, which have since been modified in many respects, was given in these columns a year ago (June 16, 1905). One of the piers was sunk to a depth of 80 ft., and others go down 50 or 60 ft. Briefly, Mr. Schaub's plan for new pier work consists of the construction of the concrete shell in practically the same way as that described in the present article, except that the temporary dam or outer form is assembled on ways and floated to the site, and then sunk by excavation in open wells either by sand pumps or dredges. When the desired penetration has been attained the shell may be filled with sand or concrete as desired, and finished in the usual way. In the Shreveport bridge concrete filling is used. In general, however, because of the relatively great depths necessary in these deposits, the plan contemplates the use of the sand filling only, up to low water at least, as the more economical, and therefore in many ways more satisfactory, method. Mr. Schaub estimates that a saving of from 30 to 50 per cent. in cost of foundations could be effected by the use of the sand. His plan differs from the older one

using a crib with pockets filled with concrete in two important essentials one being the absence of timber within the shell, and the other the sand filling.

As indicative of the behavior of such a structure of reinforced concrete in withstanding unexpected stresses, two incidents which occurred in connection with the work on the Clarenden bridge are of interest. As explained in the article, the temporary dam was supported from the tops of the cylinder piers, the tackle, of course, also sustaining a considerable part of the weight of the constantly growing concrete shell. When the total weight had reached something like 600,000 lbs. the tackle unexpectedly gave way and the uncompleted dam was precipitated to the bottom with such force as to attain approximately the penetration originally desired. Despite the unusual stresses to which it was thus unintentionally subjected, careful examination failed to reveal a single crack in the concrete. The second incident occurred after the completion of the shell. Contrary to the intention of the engineer, and without his knowledge, the foreman on the work sealed the dam at the bottom with concrete. As he did not pump out the contained water, the result was that as the filling progressed the upper portion of the shell was subjected to a hydrostatic pressure, which subsequent calculation showed to have used up completely the factor of safety allowed in designing it. However, the structure suffered no injury whatever.

The paper of Mr. Henry W. Thornton, read before the Traffic Club, of Pittsburg, which we reprint this week, deserves careful reading not only by operating and traffic men, to whom primarily it is addressed, but by railroad men of all departments, be they high or low in the service. Shippers and managers of industries also come in for some good advice and would profit by a perusal of the paper. None of the points which Mr. Thornton makes may be new, his subject—co-operation—certainly is not, but there is an engaging frankness, a spiciness and a convincing quality about his discussion that gives it interest even to the non-technical reader. Those whom it most particularly concerns should keep it convenient for periodical re-reading, such discussions of this subject being all too rare, and good sermons are too soon forgotten. The arguments that superintendents, if for no other reason than through selfish motives, would find it to their interest to aid the traffic department to secure business, and that every employee, no matter how humble his station, is likewise helping himself in inducing his neighbors and friends to patronize his road, are sound logic; just as it is natural for men working under the stimulus of self-interest not only to accomplish more work but a better quality of work, than where duties are perfunctorily performed. The suggestions regarding the traffic officer's direct interest in retrenchment are of equal value in pointing out the effect which his attitude toward the public has in making it easy or difficult to retain existing competitive business and obtain new business; and of the importance of knowledge on his part of costs of movement of the business he obtains. As to the "absolute frankness and honesty" between managers of industries and railroad officers which Mr. Thornton recommends, and sets forth in some detail to show what he means, such co-operation is, of course, possible, and would be most delightful; but if it should ever become the general rule instead of the very rare exception, the millennium will doubtless be following close on its heels. But it is worth while that the ideal kind of management should be held up in plain sight, even if it cannot always be realized; and Mr. Thornton shows—like our esteemed contributor, Mr. R. C. Richards—that it always pays to remember that the final purpose of the work of every officer and employee, whether he be general manager or telegraph operator, is to make the railroad prosper.

STATE RAILROADS—THE LESSON OF ITALY.

We print this week the third paper of a series on the government railroad monopoly in Italy by Mr. Giuseppe Spera, who has had a long and useful service as engineer of the government council. Mr. Spera has pointed out that the Italian government and parliament took it upon themselves to solve the railroad problem in Italy when they were totally unprepared from a technical, economic and administrative standpoint. The results have been a long-drawn-out failure, with about every variety of bad railroad service. The first railroad in Italy was opened in 1839, but until 1859 the system of separate and independent Italian states naturally greatly hindered development, and Hadley, in his "Railroad Transportation," points out that as far as there were any railroads at all each state had its own separate system. The systems were not merely independent, but were isolated. The railroads of Tuscany did not reach those of Rome; those of Rome did not reach those of Naples. After the series of wars from 1859 to 1870, and the formation of the present government, the railroad system was in the main connected, although the conflict between the natural economic development along the line of the through routes from northwest to southeast, and the old crosswise political divisions occasioned the Italian system to be broken up into four groups. These roads were originally operated, part by the state and part by private companies, helped by government subsidies. In the '70s the railroads were in extremely bad shape physically and financially, and the government undertook the operation of them. In 1876, however, the Italian parliament voted to reverse this course, and the Minister, Depretis, was instructed to draw up a plan under which private companies might manage the state railroads. The history of this management was marked principally by two contradictory features: by a studious parliamentary research into the situation and by great recklessness in expenditures. It was estimated that it would cost $125,000,000 to put the systems in shape for proper private operation. As a matter of fact, this was doubled before the work was really under way, and was constantly increased thereafter for political reasons much like those which influence our own congressmen in the conduct of river and harbor appropriations. In a word, government ownership supplemented by government operation having promptly proved a failure, the policy was reversed in 1885, after the work of the parliamentary committee, and then government ownership with private operation failed, although it was arranged, as Mr. Spera points out, that the companies should pay the government $53,000,000 to represent the value of the railroad material, and then should operate the roads, the government agreeing to pay their annual interest charge of $369,730.

This experiment was just as unfortunate as the other. The properties were insufficiently maintained, they were not profitable, rates were up and service was down, and all the time they were a drain on the government.

In the face of popular clamor the policy has for the third time been reversed, and now the government has taken the operation of the railroads back again. It seems impossible that it should succeed now any better than it succeeded thirty years ago, and the outlook is not a hopeful one. The wretched tangle of bad policy, bad finance and bad service which has occupied so unnecessarily much of the time of the Italian state for the last generation, stands as a perpetual warning to those who see only economy, efficiency and good service in state railroad ownership and management.

TRADE COMBINATION AND RAILROAD COMBINATION.

In view of the confusion of popular distinctions it is not surprising to present-day observers to see how commonly the trade combination and the railroad combination in this country are bracketed as one. The party platforms, especially in the west, have often joined the two almost in the same sentence, the campaign orator has caught the same keynote, and even writers and economists of higher intellectual cast than the politician have sometimes followed the same bent. In the impulsive reasonings of such thinkers both railroad consolidation and the trust represent "combination," both have to do with prices—under different technical terms—and both are aimed at competition; *ergo* both fall into one economic order. Certain rough and general analogies of the two may be conceded. At the same time, during a period when both the railroad and the trade combination are under fire, it is well to point out certain distinctions, practical as well as academic. Those differences may not serve for some time to come to change the face of legislation or, still less, shift public feeling. But they are fundamental enough, in the slow grinding of the economic mill, to work out ultimate results.

Railroad consolidation and the trade combination both happen to be present facts with the result of obscuring past history. The immediate synchronism fills the vision and clouds the larger fact that the consolidation of American railroads far antedated the great rise of the trusts. The one reaches back for several decades as a steady and progressive movement following a fixed law; the trade combination and the rise of the so-called "industrials" moved very slowly until they came with a veritable rush some five or six years ago. Railroad consolidation in its incipiency and progress was, relatively at least, non-speculative and based much more on economies of operation than on paper values; the "boom" of the industrials exactly reversed the process with speculation and "flat" values at the front and administrative economies either so far in the rear as to be unseen, or, if made prominent, only for a speculative prognostic. It is true that the industrial trade combination

climax of half a dozen years ago was timed with considerable increase of the pace of railroad combination, and in some cases the application of the "holding company" device to large railroad properties, as well as with inflation of street railroad securities. But the latter was an incident of new invention rather than a logically evolved tendency; and the truism remains that, in contrast with the sudden mushroom growth of the great majority of the large trade combinations, steam roads have united under a force far-reaching, persistent, comparatively steady in its compulsion, and, in the most unqualified sense, historic. That fact alone should have some meaning for those in authority, who are called upon to deal in these days with the problems of the great railroad system.

Another distinction to be accented is one of limitation. The great railroad systems of the country have fallen naturally into a series of groups, few of them having complete local monopoly and none of them a monopoly of very long distance traffic between great terminal cities. In the evolution of these systems there seems to have been reached now a kind of territorial limit, and, as a general truth with some exceptions, indisposition on the part of one group to encroach quickly on the local domain of another. This situation may or may not continue. But it is certain that the prophecies heard three or four years ago of new combinations of a size that would dwarf the old are now stilled or heard only on the lips of the professional bull speculator. At a period of revived governmental interference there is also the spectre of federal control standing athwart the path of further consolidation on a huge scale. But on the trade combination there is in this country no territorial limit. The trust may fear government intervention, but, unlike the railroad, suffers from no natural territorial check. Whether an incorporated body of trustees or acting under voluntary agreement, its reach is for complete control of the specific commodity or set of commodities in which it deals. Indeed, substantial control of the prices of such commodities is a prime law of the trust's successful life. The railroad may thrive fairly well in the face of moderately sharp competition. The trade combination almost never.

When we come to the consumer, using that term in its most ample sense as including not only purchaser but also freighter and passenger, another divergence comes to view. In the great majority of cases the trade combination has been aimed directly at competition and has been followed pretty promptly by a rise of prices—if for no other reason, because of the quest for dividends on inflated capital. The trusts, and especially those trusts formed a few years since, were marked by a proclaimed policy of "regulation" rather than advancement of prices, but, in practice, both those ends have been sought with the advanced price more clearly than "regulation" descried by the public eye. With railroad consolidation a different economic tale is told. As a general truth, reduction of freights and fares, even in territory quite monopolized, have been steady and permanent, yet with dividends increased rather than lowered. Within three months have come the official announcements of reduced passenger fares on both the Pennsylvania and the New Haven systems. Partly, no doubt, this downward curve in freights and fares is an exponent of the high national prosperity, but may it not be even more the sequel of a condition in which genuine "regulation," system and efficiency have followed railroad consolidation? Whatever the cause or causes, the vivid contrast presents itself between recent industrial consolidation which has lifted prices for the consumer and railroad consolidation which has lowered them. And, if the further test of the relative stability of values and of credit of the two classes of prosperity is sought, one may find it by a very cursory glance at the quotations of the stock market reduced to the rate of return on the investment.

We come, finally, to the most vital distinction of all, not the less important because it is familiar and obvious—the difference between the trade combination as a *quasi* private concern, and the railroad as a "public service" corporation. In the final analysis that distinction, indeed, seems to fade away. When we search the depths of the question it is hard to see why the trade combination that controls, seeks to control or hopes to control any article of first necessity sold to every household in the land, does not stand in a relation of public service, while a corporation that sells transportation does so. The difference is technical rather than real, but, in practice, has widened into a vast gap. The trade combination is exempt from public supervision; it renders no reports, not even to its stockholders, save, in some cases, those of a most condensed character; and the most ingenious and studied legislative effort has thus far failed to exact publicity and—at any rate in the case of "voluntary" combinations—is likely to continue to fail. Such non-publicity can be and is used alike to mask prosperity, adversity and speculative manipulation of both. Contrast with this the fierce light that beats on the affairs of the railroad corporation—its reports sometimes monthly, often quarterly, always annual, one for stockholders, another, and in different form, for the state; and the complex methods of regulation shaped by hundreds of pages of state laws, and thirty-five or more state railroad commissions, besides the federal body lately charged with new power over interstate traffic! Such a disparity based upon the "public" relation or absence of it is alone enough to suggest consistency, if not wisdom, to the legislators, to the party conventions and to the campaign talkers who have been wont to blend railroad and trust in the same economic category.

Divergencies in history, in territorial limitation, in the private relation, in the public relation—all these, some of them in radical forms, come forth in the campaign of the great railroad groups and the great trade groups. How the two, with their deep, and, in some directions waxing, problems, will emerge in the far future no man can tell, and the interrogation mark set against the query is deep, dark and long. But, if the question is answered, say, a hundred years hence, we venture to say that the political economist writing then will set it down as one of the marvels of our present era that interests so divergent in form, substance, functions and public and private status were so often linked.

July Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of July, printed in another column, contains accounts of 24 collisions and 32 derailments. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

	Place.	August	Killed.	Injured.
1.	Maple Hill, Kan.	5th	2	2
2.	Gulpha, Ark.	7th	0	25
3.	Chattanooga, Tenn.	8th	4	0
4.	Plantersville, Texas.	16th	3	2
5.	Hamlet, N. C.	22d	16	31
6.	Waneta, Wash.	22d	4	7
7.	Camden, Wash.	23d	4	3
8.	Springfield, Mo.	26th	0	25
9.	New Hamburg, N. Y.	29th	2	12

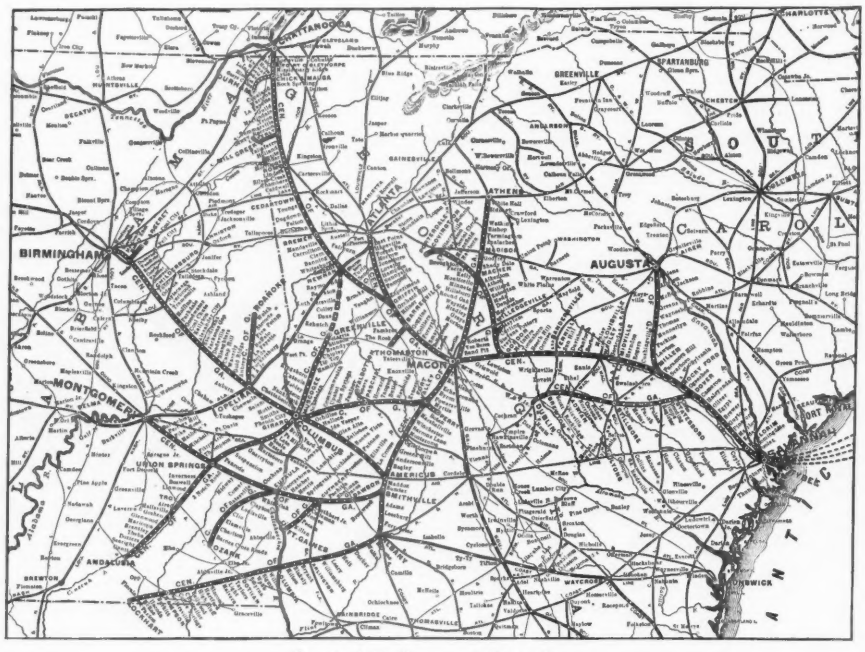
The Hamlet collision, the worst in the list, might be taken as a shining illustration of a typical weakness of the American system of managing the rights of trains on a single-track railroad. The failure of the operator to deliver the order, when explained in the government report next January or February, may or not be found to differ in detail from a large number of other failures with which the reader is acquainted. Our discipline in this respect fails often enough to make failures a familiar thing, to officers who watch this department of the work, and the question need not be called important just here. The difficulty of insuring the delivery of orders unerringly is so well recognized that provision is made against it by a rule requiring meeting orders to be sent to two places—one the meeting place and the other a place which the train will reach before approaching the meeting place. That provision appears to have been in the rules of the road in this case, but it failed. If no such precautionary provision had been prescribed, a greater dependence would necessarily have been placed on the engineman. Safety would have depended on his surely seeing and heeding *one* stop signal. Whether or not this engineman, in the absence of a rule requiring the use of the "middle" order, would have exercised extreme caution and have been able to scent the cause for not receiving an order against the opposing train at a certain place, cannot be told; but the suspicion that his knowledge of the order-at-two-places rule lessened his vigilance will occur to many minds. Whatever may be the facts in this particular, the main fact—that the numerous props provided to support our train-rule structure often fail to dovetail together as they should—is patent to all.

This collision marks progress, in one respect. It has led a state railroad commission to say that "the commission is satisfied the collision would not have occurred had the block system been in operation at that point."

The number of electric car accidents reported in the newspapers of the United States in July was 28, in which eight persons were killed and 186 injured. The most serious accident was a butting collision, due to a misplaced switch, at Martinsville, N. Y., in which the number reported killed was five and of injured 20. At Los Angeles, Cal., on the 28th, a street car was struck by a locomotive, killing three of its occupants and injuring a large number.

The Nashville, Chattanooga & St. Louis has just issued a new book of rules governing the operating department. With this book the N., C. & St. L. uses the code of the American Railway Association for the first time. Up to this year the use of red signals on the front of trains to indicate a following section, and other practices which everywhere else are almost unknown to the younger railroad men, were still in vogue on the N., C. & St. L. (Our recent

allusion to the Michigan Central as the last of the large roads to adopt the standard code was not made on the assumption that the N., C. & St. L. was not a large road, but was due to the fact that its peculiarities of practice had for the moment slipped the editor's attention). Most of the essential features of the code now issued may be found in the article by Mr. Forman which is printed in this and two preceding issues of the *Railroad Gazette*. Mr. Forman has been with the Nashville, Chattanooga & St. Louis for a number of months now, and the marks of his work are to be seen throughout the book. The most notable feature of the book in which the views of the management of the road differ from those of Mr. Forman is that embraced in Rule 88. This rule requires a superior train to wait five minutes at schedule meeting points for an opposing train of the same class, although in all other cases—that is to say, at stations other than the schedule meeting point, when running under the time-table, and also in cases where the train is running under a "wait" order," or a "run-late" order from the despatcher—the superior train is in fact absolutely superior, being never required to wait for the opposing train a single second. It is also to be noted that the N., C. & St. L. does not require the headlights of locomotives to be concealed when a train is waiting at a meeting point. This is uncommon, but it has long been the practice there and it is also the practice on the Louisville & Nashville. The N., C. & St. L. book contains much interesting reading besides that in the standard code; i.e., in the rules of what is called the non-standard portion; the rules not discussed by Mr. Forman (although he reprints a few of them at the end of his article). These rules contain many phrases which could be adopted with profit in other codes; and the way in which the reasons for doing certain things are given in the rules in numerous cases is highly commendable. Giving the reason frequently serves to soften the attitude of a critical or unwilling employee. For example, rule 463 says that engines must not stand near stations, telegraph offices, or passenger trains "where the noise and smoke will disturb the occupants." Rule 481, forbidding the giving of a red hand signal with a white light in the same hand, which we have seen in one other code, here has the reason attached—"As a white light near a colored one prevents the colored light from being as readily seen." Passenger brakemen, when standing near a car to assist passengers, must "maintain an erect attitude; never lean against the cars," etc.



Central Railroad of Georgia.

Three different sorts of road motor vehicles are in use by the North-Eastern Railway (England) in the area which it serves. It now has at work seven motor omnibuses, 16 motor wagons and nine motor charabancs, which are helping to develop the districts in which they work. From some of these districts the company had petitions for the construction of light railroads, but, after careful consideration, came to the conclusion that they would not pay, and the motor buses were tried as a substitute. The different classes of motor vehicles have been a convenience to the people for whom they were intended. The motor wagons have assisted the farmers in carrying small parcels of agricultural produce, which they would have had a difficulty in conveying with their horses and carts, and the charabancs have been very useful for pleasure parties. Earnings from this source of traffic have not been a very important feature as yet, but they increased during the past half-year and are still growing. The possibilities of breakdowns have also been reduced by remedying certain weaknesses in the machinery of the motor buses.

Central of Georgia.

In 1895 this company succeeded to the foreclosed properties of the Central Railroad & Banking Company of Georgia, and in 1901 there was merged with it the Chattanooga, Rome & Southern, now the Chattanooga division. The Central of Georgia has only $5,000,000 capital stock (or at the exceptionally small rate of $2,662 a mile), all of which is controlled by interests who manage the road in harmony with the Southern Railway. The capitalization is an unusual one in other ways than in the small amount of stock. In addition to various first mortgages amounting to some $35,000,000, there are preference income bonds to the amount of $15,000,000 outstanding, $4,000,000 each of first and third preference incomes, and $7,000,000 of second preference incomes. These income bonds are entitled to not more than 5 per cent. non-cumulative, when earned, and full payments on all of them were for the first time made in October of last year. Payments ranging from 1½ to 5 per cent. have been made on the first incomes ever since the company was organized. The first payment on the second incomes was in 1904, when 2 per cent. was paid, and the payment of 5 per cent. on the third incomes in 1905 was the first payment on that issue.

The past fical year, in which there were large increases in earnings over the fiscal year 1905, on the basis of whose earnings payments of the full amount on all the income bonds was made, was by far the most prosperous year in the history of the road. Favorable returns for the Central of Georgia represent distinctly prosperity in the South, for the road, as will be seen by the map, is mainly a collection of branch and connecting lines, filling up a large portion of the state of Georgia, with various arms reaching west into Alabama and a northern connection for through traffic to Chattanooga, Tenn. Traffic statistics also go to make this clear, for they represent no one or two traffic specialties, but, on the whole, a general traffic. Lumber, to be sure, furnished 1,101,648 tons of the 4,675,596 tons carried in 1906, but with this exception and that of butuminous coal (684,053 tons) and fertilizers (551,932 tons), the traffic is fairly well distributed. The largest of the other items are grain, 222,000 tons; cotton and cotton products—the typical southern commodity—387,880 tons; cement, brick and lime, 247,246 tons; merchandise, 318,941 tons, and miscellaneous, 189,426 tons. The manufactures and miscellaneous group, which may usually be considered the highest grade traffic, furnished 1,561,948 tons, or one-third of the total.

The 1906 earnings were $11,396,000 gross, an increase of $1,261,000, or over 12 per cent.; and $3,160,900 net, an increase of $443,821, or over 16 per cent. After all fixed charges, including equipment trusts, rentals and a year's interest on the three classes of income bonds, there was a surplus for the year of over $500,000. Gross earnings per mile, which as lately as 1902 were only $4,202, were $6,069, an increase of $672 a mile over 1905. Net earnings per mile ($1,057 in 1902) were $1,683 against $1,447 in 1905. Passenger earnings, which as a whole increased 11.81 per cent. in 1905, were $393,252 larger in 1906, an increase of 13.77 per cent. Freight earnings showed about the same proportionate increase = $929,022. There was a slight increase in earnings per passenger mile against a decrease almost as large in the ton mile receipts. The number of revenue passenger miles was 112,175,658 against 101,319,130 in 1905, an increase of 10.72 per cent., while the number of ton miles of revenue freight increased from 595,231,752 in 1905 to 701,066,873 in 1906, a gain of 17.78 per cent. The ton miles of both revenue and company freight were 874,148,597, an increase of 18.23 per cent. over 1905.

Owing to the large amount of local and branch line traffic the train load naturally cannot compare favorably with that of an important through line or a coal and ore road, but steady increases are being made. In 1904 the average loading was 187 tons. This rose to 208 tons in 1905 and to 218 tons last year, the latter an increase of 4.65 per cent. This is for revenue freight. For all freight the train load increased from 259 tons in 1905 to 271 tons last year. The freight traffic density has been steadily on the increase since 1902, when the number of revenue tons one mile per mile of road was 255,594. Last year it was 373,339, following 316,979

in 1905. The same figure for passenger traffic was 59,737 revenue passengers one mile per mile of road against 53,955 in the year previous. The 18 per cent. larger freight traffic was carried with an increase of only 12.80 per cent. in the freight train mileage, including in this mileage the freight proportion on a car mileage basis of the mixed train mileage. The increase in freight engine mileage at the same time was less than 14 per cent. The larger traffic, therefore, seems to have been handled with reasonable economy, although the General Manager states that notwithstanding liberal expenditures for general improvements there was at times considerable difficulty in properly handling all business offered.

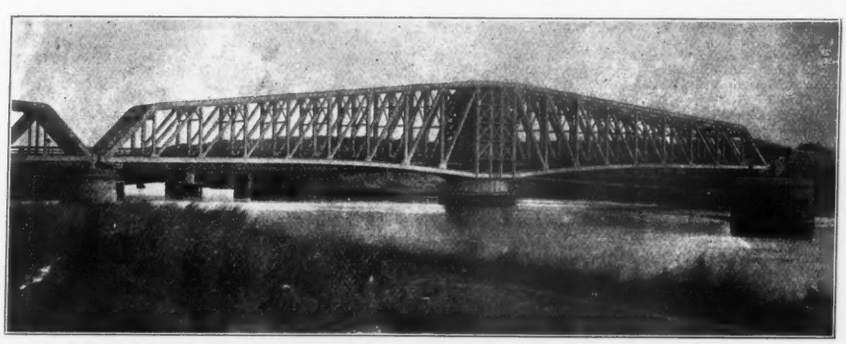
Under operating expenses, maintenance of way and structures increased $238,000, maintenance of equipment decreased $32,000, and conducting transportation increased $498,461; the largest increases in the latter group being in fuel for locomotives, $140,000; freight train service, $43,000; station laborers, $57,000; per diem balance, $36,000; freight loss and damage, $26,000; injuries to persons, $52,000; rent of tracks, yards and terminals, $16,000; switchmen, flagmen and watchmen, $42,000, and freight engineers and firemen, $61,000.

One important piece of new construction is under way, a new connecting line from Greenville, the terminus of a 50-mile branch running north from Columbus, Ga., to a point near Newnan on the Chattanooga division. This is to connect the Chattanooga division with the Alabama territory so as not to have to carry traffic by a roundabout route as at present. The new connection is to be 24 miles long and should be completed by November 1st. During the year, in anticipation of this construction, the Columbus-Greenville branch was widened from 3-ft. gage to standard, and about two miles of trestle on it eliminated by providing suitable waterways and by filling. Grades on the Chattanooga division were also reduced.

One hundred new side tracks and spur tracks, aggregating 13.55 miles, were built, and 58 such tracks were extended, making a total of 18.78 miles of new side track built during the year. Extensive terminal improvements are nearing completion at Albany and Savannah, Ga., which include enlargement of the yards and erection of a 2,500-ton coal bin at Albany and a new receiving yard at Savannah. There were 56 miles of new 70-lb. rails and 25 miles of new 80-lb. rails placed in the track during the year. Of the total operated mileage of 1,878 miles, 504 miles are laid with 80-lb. and 140 miles with 70-lb. rails.

Under an equipment trust there were bought during the year 450 ventilated box cars, 500 coal cars, 400 flat cars and 50 ballast cars. The outstanding obligation of the road in equipment trusts on June 30, 1906, was $2,429,765. On July 2, 1906, under an additional trust there were contracted for five switching locomotives, 10 passenger locomotives, 25 freight locomotives, 1,000 plain box cars of 60,000 lbs. capacity, and 1,000 all-steel coal cars of 100,000 lbs. capacity; these to be delivered in time for next winter's business. Fifty stock cars of 60,000 lbs. capacity were built at the Savannah shops during the year.

A new coal development on the company's lines has been put in operation through the completion of the Henry Ellen spur, 10½ miles long, operation of which was begun last month. This reaches coal lands in St. Clair County, Ala., belonging to the company and leased on a royalty basis. A minimum production of 600 tons a day is now guaranteed, and this amount under the terms of the contract is to be increased every six months until output is at the rate of 2,000 tons a day. This coal property, including lands, railroads and franchises, was bought last year for $600,000, which was paid in a new issue of purchase money first mortgage Upper Cahaba Branch bonds.



New Electric Drawbridge at Velsen, Holland.

The following are the principal statistics of the year's operation:

	1906.	1905.
Mileage worked	1,878	1,878
Passenger earnings	$3,248,396	$2,855,145
Freight earnings	7,737,661	6,808,639
Gross earnings	11,396,123	10,135,055
Maint. way and structures	1,845,793	1,607,530
Maint. of equipment	1,712,132	1,744,226
Conducting transportation	3,892,830	3,394,369
Operating expenses	7,882,217	7,091,527
Net earnings	3,160,910	2,717,089

NEW PUBLICATIONS.

Water Softening and Treatment. By William H. Booth. New York: D. Van Nostrand Co. 308 pages; 6x9 inch; 92 illustrations. Price, $2.50.

On the title page of this book there is added Condensing Plants, Feed Pumps and Heaters for Steam Users and Manufacturers. It is suggested that a descriptive title of the book might be the Preparation, Use and Manipulation of Water for Boiler Purposes. It is such a work as can be profitably read by lay manufacturers who know that they are using large quantities of water in their power plants; that there is more or less trouble connected with the same, but who do not know the reason therefor nor have any very definite idea of the proper way out.

Water softening, to which the book owes its name, occupies the longest of the five sections, into which the whole is divided. Naturally, in treating a subject of this kind, that is so purely a chemical one, the usual formulæ expressing the composition of the impurities of the water, that of the reagents used and the action that follows are employed. The language of the text, however, is such that any well-informed layman can read it intelligently, and yet it does not at all savor of the popular style that says and teaches nothing. It is such that the boiler owner who is having trouble with scale-forming waters should, after reading and studying it, be able to proceed intelligently to remove his difficulties without making mistakes that will be injurious to the plant.

In its general scheme, the first section treats of the sources of water impurities and their composition, and the reactions of the agents used in its purification, taking up both the common and the less usual ones that are used; a brief chapter on scale and its effects, and one but little longer on water analysis, in which an outline of the methods to be employed in this work are given. But for a full treatment of water analysis, readers are referred to works on chemistry.

To the possible user of a water-softening plant the chapter on Apparatus in Commercial Use is especially valuable in that it gives concisely and clearly the principles upon which the successful apparatus must be made and work. Then follows another chapter giving an outline description of a number of typical apparatus that are upon the market.

The other sections deal with the subjects with which all steam users should be familiar, a familiarity that will mean much saving of expense if it is properly utilized. These subjects are air pumps, condensers, feed water heaters, water cooling, feed pumps and injectors, each of which is handled in a way that is readily understood, and in a style that tends to fix the meaning of the author in the mind without requiring an especial effort on the part of the reader. As stated at the outset, the book is one that commends itself to the attention of the boiler user who is having trouble with scale-forming waters and wishes to free himself from these annoyances.

New Electric Drawbridge at Velsen, Holland.

The Velsen bridge, the largest of its kind in Europe, is 940 ft. long, and crosses the North Sea Canal. The bridge is partly fixed and partly rotary, the length of the draw being 427 ft. and that of the fixed spans 513 ft. It is built with a revolving pier on one side of the navigable channel, and with a supporting pier on the other side. The arms of the revolving part of the bridge are thus of equal length. One of these arms reaches over the fairway of the canal and a portion of the shore, while the other stretches over the passage way. A strong rigid bridge spans the other portion of the fairway and a part of the shore on the other side. The bridge is approximately 20 ft. 8 in. above water level, and the width of the passageway between the two piers of the canal is about 180 ft.

The rotary pier is a cylinder 45 ft. in diameter and is built of concrete faced with granite. Within this granite facing is fitted the supporting ring of granite, the divided surface of which is raised 1 cm. and bevelled off. This latter, by the intercalation of copper plates, carries the cast-iron base of the metal superstructure, and is fastened to the supporting ring by means of 216 bolts and nuts. The hollow cast-steel pivot or spindle is located upon the center of the top surface of this pier, to which it is fastened by means of six cramp irons let well into the masonry work.

The foundation of the rotary pier was placed pneumatically upon the Mortier & Thouvard system. The supporting pier, the foundation of which was placed in the same way, is oblong at the bottom, constituting a rectangle between the semi-circles. It is also of concrete, reinforced at the upper surface with granite. The protecting pillar was built by sinking a bottomless cylinder or jacket to a depth of about 49 ft.; as no weight is ever thrown upon the

pillar, which merely serves to lock or bolt the bridge open, the pneumatic system of construction was not necessary in this case. The total substructure of the bridge, including piers and abutments, cost $160,000.

The bridge is built for a double railroad track and has three main bearings. Following the method adopted for large American revolving bridges, the rotary part rests upon the rotary pier by means of a ring of rollers.

The weight of the revolving portion of the bridge is about 1,400 tons, unloaded, the weight being calculated at 2,100 tons when the bridge is closed and under load.

The New Standard Code.

BY H. W. FORMAN.

(*Concluded from page 156.*)

FORMS OF TRAIN ORDERS.

FORM A. FIXING MEETING POINTS.

EXAMPLES.

(1.) *No 1 Eng 20 will meet No 2 Eng 30 at B.*
(2.) *No 3 will meet Second No 4 at B.*
(3.) *No 5 will meet Ex 40 North at B.*
(4.) *Ex 50 South will meet Ex 60 North at B.*
(5.) *No 1 and Second No 3 will meet Nos 2 and 4 at B and Two Exs 70 and 80 North at C.*

Trains receiving these orders will run with respect to each other to the designated points and there meet in the manner provided by the rules.

FORM B. DIRECTING A TRAIN TO PASS OR RUN AHEAD OF ANOTHER TRAIN.

EXAMPLES.

(1.) *No 1 will pass No 3 at B.*
(2.) *No 6 will pass No 4 when overtaken.*
(3.) *Ex 20 South will run ahead of No 5 B to E.*
(4.) *No 15 will run ahead of No 1 from B until overtaken.*
(5.) *No 15 will run ahead of No 1 A to Z unless overtaken.*

When, under Example 1, a train is to pass another, both trains will run according to rule to the designated point, and there arrange for the rear train to pass promptly.

Under Examples 2, 4 and 5, both trains will run according to rule until the train in advance is overtaken at some siding, and there arrange for the following train to pass promptly.

Under orders similar to Example 3, the second-named train must consider the character of the train first named and look out for it, especially on heavy ascending grades or where the view is obstructed, but this in no way relieves the first-named train from properly protecting.

When an inferior train receives an order to pass a superior train, right is thereby conferred to run ahead of it.

FORM C. GIVING RIGHT TO A TRAIN OVER ANOTHER TRAIN.

EXAMPLES.

(1.) *No 2 has right over No 1 H to D.*
(2.) *Ex 20 North has right over No 3 H to D.*
(3.) *Ex 30 South has right over all trains A to Z.*

This form of order makes the train over which right is given inferior to the train which is given right over it, between the points named, and it must not enter the designated limits without further orders over the train thus made superior, unless its time can be cleared at least five minutes.

If the trains meet at the first or last named point, the train which is inferior by rule must take siding. Between the designated points, the train over which right is given must take siding, unless otherwise instructed by order.

If the trains meet within the limits named, the train over which right is given must identify itself to the other train.

FORM E. TIME ORDERS.

EXAMPLES.

(1.) *No 1 will run twenty 20 mins late A to E.*
(2.) *No 1 will run one 1 hour and twenty 20 mins late D to E one 1 hour and fifteen 15 mins late E to H etc.*

Examples 1 and 2 make the schedule time of the train named, between the stations mentioned, as much later as stated in the order, and any other train receiving the order is required to run with respect to this later time, as before required to run with respect to the regular schedule time.

(3.) *No 1 will wait at E until ten five 10 05 a m for No 2.*

Under Example 3, the train first named must not pass the designated point before the time given, unless the other train has arrived. The train last named is required to clear the time specified, at the designated point, or any intermediate station where schedule time is earlier than that named in the order, at least five minutes.

(4.) *No 1 will wait at E until ten fifteen 10 15 a m.*

Under Example 4, the train named must not pass the designated point before the time given. Any opposing train receiving the order is required to clear the time specified, at the designated point, or any intermediate station where schedule time is earlier than that named in the order, at least five minutes.

(5.) *No 1 will run on the following late schedule:*
Leave A eleven thirty 11 30 *p m*
" *B twelve twenty five* 12 25 *a m*
" *C one forty seven* 1 47 *a m*
Arrive D two twenty five 2 25 *a m*

Example 5 makes the schedule time of the train named, between the stations mentioned, as shown in the order, and any other train receiving the order is required to run with respect to this later time as before required to run with respect to the regular schedule time. The train named loses its schedule when twelve hours behind time-table schedule time, as prescribed by Rule 82.

FORM F. CREATING AND CHANGING SECTIONS.

EXAMPLES.

(1.) *C & E Engs 20 and 30 A.*
Engs 20 and 30 will display signals and run as First and Second No 1 A to Z.
(2.) *Eng 40 will run as Third No 1 A to Z.*
(3.) *Engs 50 60 and 70 will run as First Second and Third No 1 A to Z.*
(4.) *C & E No 1 and Eng 80 A.*
No 1 will display signals A to E for Eng 80.
(5.) *Second No 1 will display signals A to E for Eng 90.*

Under Example 3, engines 50 and 60 must display signals. See Rule 20.

(6.) *C & E 1st and 2d No 1 E.*
Eng 30 is withdrawn as Second No 1 at E. First No 1 take down signals at E.

Under Example 6, engine 30 surrenders its authority to run as second No. 1, and its train orders become void at E.

When it is necessary to take down signals before reaching the point to which they were directed to be displayed, instructions will be given as shown in this example, or the order creating the section will be annulled. An order may be given to again display signals.

(7.) *C & E 1st 2d and 3d No 1 E.*
Eng 20 is withdrawn as First No 1 at E. Following sections change numbers accordingly.

Under Example 7, engine 20 surrenders its authority to run as first No. 1, and its train orders become void at E, and the following sections must take the next lower number.

(8.) *C & E Eng 40 and 1st 2d and 3d No 1 E.*
Eng 40 will display signals and run as First No 1 E to Z. Following sections change numbers accordingly.

Under Example 8, engine 40 is made first No. 1 at E, and the following sections must take the next higher number.

(9.) *Order No — is annulled. Engs 60 and 50 will run as First and Second No 1 E to Z. Eng 60 pass Eng 50 at E.*

Example 9 may be used to pass a section by another, the order or instructions annulled being those which created the section. The section to be passed must not take down signals until the section which is to pass it has arrived.

The character of sections may be stated. Those affected must receive the orders, and must arrange signals and numbers accordingly.

FORM G. EXTRA TRAINS.

EXAMPLES.

(1.) *C & E Eng 20 A.*
Eng 20 will run extra A to E.
(2.) *Eng 30 will run extra A to E and return.*
(3.) *Eng 40 will run extra A to E and return to B.*

Under Examples 2 and 3, the extra should go to E before returning, but, when necessary, the return portion of the order may be used without doing so. Whether the extra runs to E or not, all of its orders become void upon its return to the point to which it is directed to return.

(4.) *Eng 50 has until nine fifty 9 50 a m to run extra D to E.*

Under Example 4, the extra named must understand that its authority to run extra between the stations named becomes void five minutes before the time mentioned in the order.

(5.) *Eng 60 will run extra leaving A Thursday Feb 17th as follows with right over all trains.*
Leave A eleven thirty 11 30 *p m*
" *B twelve twenty five* 12 25 *a m*
" *C one forty seven* 1 47 *a m*
Arrive D two twenty-two 2 22 *a m*

Example 5 may be varied by specifying the kind of extra and the particular trains over which it shall or shall not have right. Trains over which the extra is thus given right must clear the time of the extra at least five minutes.

When practicable, extra trains should be given running orders to their destination at the starting point.

FORM H. WORK EXTRAS.

EXAMPLES.

(1.) *C & E Eng 20 A.*
Eng 20 will work extra six thirty 6 30 *a m until six thirty* 6 30 *p m between A and B.*

Under Example 1, the work extra is not required to protect against extra trains. The time of regular trains must be cleared as prescribed by the rules.

A work extra may be directed to clear the track for, or protect itself after a certain hour against a designated extra by adding to Example 1 the following words:

(2.) *and will keep clear of* (or, *protected against*) *Ex 30 South between A and B after two ten* 2 10 *p m.*

Under Example 2, extra 30 south must not enter the working limits until 2 10 p. m., and then run expecting to find the work extra clear of the main track (or protecting itself) as the order may require.*

When the movement of an extra over working limits cannot be anticipated by these or other orders to the work extra, an order must be given such extra to protect itself against the work extra in the following form:

(3.) *Ex 30 South will protect against Work Ex 20 between A and B.*

Under Example 3, extra 30 south must protect against the work extra as prescribed by Rule 99. This may be added to the order to run extra.

When it is desirable that a work extra shall at all times protect itself against extra trains while on working limits, it may be done by adding to Example 1 the following words:

(4.) *protecting against extras.* (or, *protecting against Southbound extras.*)

A work extra receiving this order must, whether standing or moving, protect itself within the working limits, as prescribed by Rule 99, in one or both directions, as the order requires.

Extra trains must not be run over working limits without notice of and provision being made for passing the work extra. When the other forms are not necessary, notice may be given as follows:

(5.) *Work Ex 20 is between A and B.*

Extra trains receiving this order will run expecting to find the work extra protecting itself.

To enable a work extra to work upon the time of a regular train, the following form may be used:

(6.) *Work Ex 20 will protect against No 15* (or, *all third class trains*) *between A and B.*

Under Example 6, the work extra may work upon the time of the train, or trains, mentioned in the order, and must protect against such train, or trains, as prescribed by Rule 99. The regular train, or trains, receiving the order will run expecting to find the work extra protecting.

When a work extra is given an order to protect against all regular trains except, say first or second class trains, it must clear the time of the regular trains excepted.

(7.) *Work Ex 20 has right over all trains between A and B seven thirty* 7 30 *p m until eleven thirty* 11 30 *p m.*

Under Example 7, the work extra has the exclusive right between the points designated, between the times named.

Work extras must give way to all trains as promptly as practicable.

Work extras must clear the time named in their train orders at least five minutes, except as prescribed by Rule 91.

FORM J. HOLDING ORDER.

EXAMPLES.

(1.) *Hold No 1 at C.*
(2.) *Hold all Southbound trains at C.*

These orders will be addressed to the operator and acknowledged in the usual manner. He will deliver copies to trains which he is directed to hold without requiring signatures.

When a train has been so held, it must not proceed until the order to hold is annulled, or an order is given to the operator in the form:

"——— *may go.*"

Copies of this order will also be delivered to trains which the operator was directed to hold without requiring signatures.

Form J will only be used when necessary to hold trains until orders can be given, or in case of emergency.

FORM K. ANNULLING A SCHEDULE OR A SECTION.

EXAMPLES.

(1.) *No 1 of Saturday Feb 25th is annulled A to Z.*
(2.) *No 3 due to leave A Sunday Feb 26th has arrived at E and is annulled E to Z.*
(3.) *Second No 5 of Monday Feb 27th is annulled A to Z.*
(4.) *Third No 7 of Tuesday Feb 28th has arrived at E with no signals and is annulled E to Z.*

The schedule or section annulled becomes void between the points named and cannot be restored.

*NOTE.—Should the work extra be found at A before 2 10 p. m., there would be no objection to extra 30 south entering its limits before the time named, provided the precaution was taken to insure that the work extra was at the station mentioned with its entire train.

FORM L. ANNULLING AN ORDER.

EXAMPLES.

Order No 10 *is annulled.*

If an order which is to be annulled has not been delivered to a train, the annulling order will be addressed to the operator, who will destroy all copies of the order annuled but his own, and write on that:

Annulled by Order No —.

An order which has been annulled must not be re-issued under its original number.

FORM M. ANNULLING PART OF AN ORDER.

EXAMPLES.

That part of Order No 10 *reading No* 1 *will meet No* 2 *at B is annulled.*

FORM P. SUPERSEDING AN ORDER OR A PART OF AN ORDER.

This is done by adding to prescribed forms the words "instead of ——."

EXAMPLES.

(1.) *No* 1 *will meet No* 2 *at B instead of E.*

(2.) *No* 2 *has right over No* 1 *Z to A instead of to E.* (or, *instead of meeting at E.*)

(3.) *No* 1 *will display signals for Eng* 30 *A to Z instead of to E.*

(4.) *Eng* 40 *instead of Eng* 50 *will display signals and run as First No* 1 *E to Z.*

An order which has been superseded must not be reissued under its original number.

LONDON & PARIS RAILROAD.

CLEARANCE CARD. FORM A.

Station Paris *Date* June 15 *190* 6 , *Time* 8 35 P *M.*

To Conductor and Engineman Train 108

I have ..(No)....(3)....*orders for your train.*

On account of a preceding train do not leave this station until 8 40 P *M.*

Jones *Operator.*

Clearance Cards, properly filled out, must be delivered with all train orders, and also as prescribed by Rules 83 and 221.

Conductors and enginemen must each have a copy and see that their train is correctly designated, also see that the total number of orders received corresponds with the number inserted above.

When necessary to deliver Clearance Cards to a train for which there are no orders, operator will write "No" in the blank space provided.

To be printed on pink manifold paper (4x6 inches).

Form 19 **LONDON & PARIS RAILROAD** Form 19

Train Order No. 30 June 15 *190* 6

To **C. & E.**

Opr

At Johnstown *Station.* | *X* *Opr.:* *M.*

Ex 20 South will meet Ex 30 North at Johnstown.

X Y Z *Superintendent.*

Conductor and Engineman must each have a copy of this order.

Made Com *Time* 2 30 a *M.* Smith *Operator.*

To be printed on pale green paper. Space for the order 5½ in. x 7 in.

Form 31 **LONDON & PARIS RAILROAD** Form 31

Train Order No. 20 June 15 *190* 6

To **C. & E.** No 1 and Ex 20 South

At Brownville *Station.* | *X* A B C *Opr.;* 1 10 a *M.*

No 1 Eng 70 and Ex 20 South will meet No 2 Eng 80 at Smithville.

No 1 will run one 1 hour and ten 10 mins late Brownville to Williamsburg.

X Y Z *Superintendent.*

Conductor and Engineman must each have a copy of this order.

Repeated at 1 15 a *M.*

CONDUCTOR	TRAIN	MADE	AT	OPERATOR
White	No 1	Com	120 a	Black
Green	Ex 20	Com	130 a	Black

To be printed on pale yellow paper. Space for the order 5½ in. x 7 in.

FORM .....

LONDON & PARIS RAILROAD.

.....Station .....190....

To C. & E. .....

5 inch. 3½ inch.

.....Chief Train Despatcher.

This form will be used as prescribed by Rule 95. Conductors must know by consulting train register that signals have been displayed for their trains.

Conductor	Train.	Conductor.	Train.

To be printed on white manifold paper.

SAMPLES OF GENERAL RULES.

337. Trains must be opened to clear public crossings while standing at stations, and in no case may a crossing be blocked longer than five minutes. While passenger trains are at stations, other trains must avoid blocking the passageway to them.

341. At railroad crossings at grade, unprotected by interlocking, trains must stop, and, if view is obstructed, one of the crew must go to the crossing and give signal when safe to proceed.

Cars or engines must not be allowed to stand on railroad crossings.

353. To avoid damage to track and bridges, care must be exercised in the movement of engines not having main or side rods in place. They must not be moved in fast freights, and under no circumstances may a speed of twenty miles an hour be exceeded. They shall be in charge of a competent man, who must frequently advise the conductor as to their condition. When practicable, side rods must be up.

354. Steam shovels, derricks, pile drivers, gun truck cars, twin loads and cars upon which are loaded heavy or long girders, or other similar freight, must be moved at a speed that is safe.

355. As far as practicable, running switches must not be made. When it is done, switch and hand brakes should be tested to see that they are working properly. Cars should be given sufficient start to run them in to clear, care being taken that speed is not such as will prevent them from being stopped before striking other cars. Do not attempt to throw switch unless there is ample space between the two cuts to admit of its being done safely. Be on the alert so that if switch is not thrown the two cuts will not collide.

365. When conductors or enginemen change off before completing their

trip, they must exchange any train orders or instructions they may have, and each must know that his train orders or instructions are perfectly understood by the other. The conductor or engineman changing must compare the train orders or instructions he receives with those in the hands of the conductor or engineman of the train to which he exchanges, before proceeding.

370. In requesting slow orders, name a speed that is safe, and instructions will be issued accordingly. Speed indicated must not be exceeded.

371. When signals are displayed to warn enginemen of unsafe track or bridges, a white signal should be placed on the engineman's side of the track at the point where usual speed may be resumed.

378. When a train order is placed at a station where the order signal is located at or outside of the switch which is used by inferior trains in going on the siding, restricting a superior train for an inferior train in the opposite direction, train despatcher will use the form "No. —— gets this order and will meet No. —— at ——." The inferior train shall then take into consideration the place where the superior train is likely to stop, and will govern its movements accordingly. When possible, the order must be sent to the superior train before reaching such station.

379. As the lights in train order signals are not required to be kept displayed at day offices after operators are excused for the night, care is enjoined upon all to prevent accident when an order is sent to a superior train at such stations between the hours of seven p. m. and seven a. m. Train and engine crews must observe order signals at all times and respect the stop indication, even though the light may have failed. As far as practicable, train despatchers should avoid restricting trains at such points during the night, and must advise with and know that newly appointed operators understand the danger of depending entirely upon the order signal. Operators must carefully watch the light, and, in addition, when necessary, use other stop signals. When torpedoes are used, they should be placed far enough from the order signal to insure stopping the train in time, but not where persons about the station might be injured by them.

393. At meeting points, if the superior train arrives first and holds the main track, it shall, if practicable, and if near it, open the switch for the inferior train to pull into siding; but this in no way relieves the inferior train from approaching under such control that it can stop at the initial switch.

Samples of Instructions for Train Despatchers.

433. In fixing meetings at stations on heavy descending grades, or where the order-signal is in an obscure location, or is near the switch at which trains enter the siding, special precautions must be taken. The train that is to be restricted must be stopped, unless the order has been delivered to it at some other station. If the order has not been thus sent to another station, the train must be stopped before the other train is allowed to act on the meeting order.

434. Familiarize yourselves with the conditions at stations, and, in issuing restricting orders, consider the conditions of the weather and the rail. Remember the danger of brakes failing.

During heavy fog, require operators to space trains a safe distance apart.

As far as possible, prevent trains from bunching at stations in such manner as to cause delay in passing.

Instructions must be issued that will insure full protection when a train is rapidly gaining upon another, or when a train starts from a point where the crew do not have opportunity to inform themselves of trains closely following.

When it is known that a train has work to do on a heavy descending grade, an obscured curve, or any unusual place, following trains should be advised.

Operators must be required to report trains promptly, and at registering points to report the signals registered by sections.

Each figure and word of a train order must be written or underscored while it is being repeated.

Under circumstances admitting of a doubt, do not attempt to hold a train upon the operator's statement that it has not passed.

Avoid a combination of orders which might cause misunderstanding. When a train order is misunderstood it must be annulled or satisfactorily explained, and the person in error corrected. When a condition exists that might result in an accident, warn all concerned.

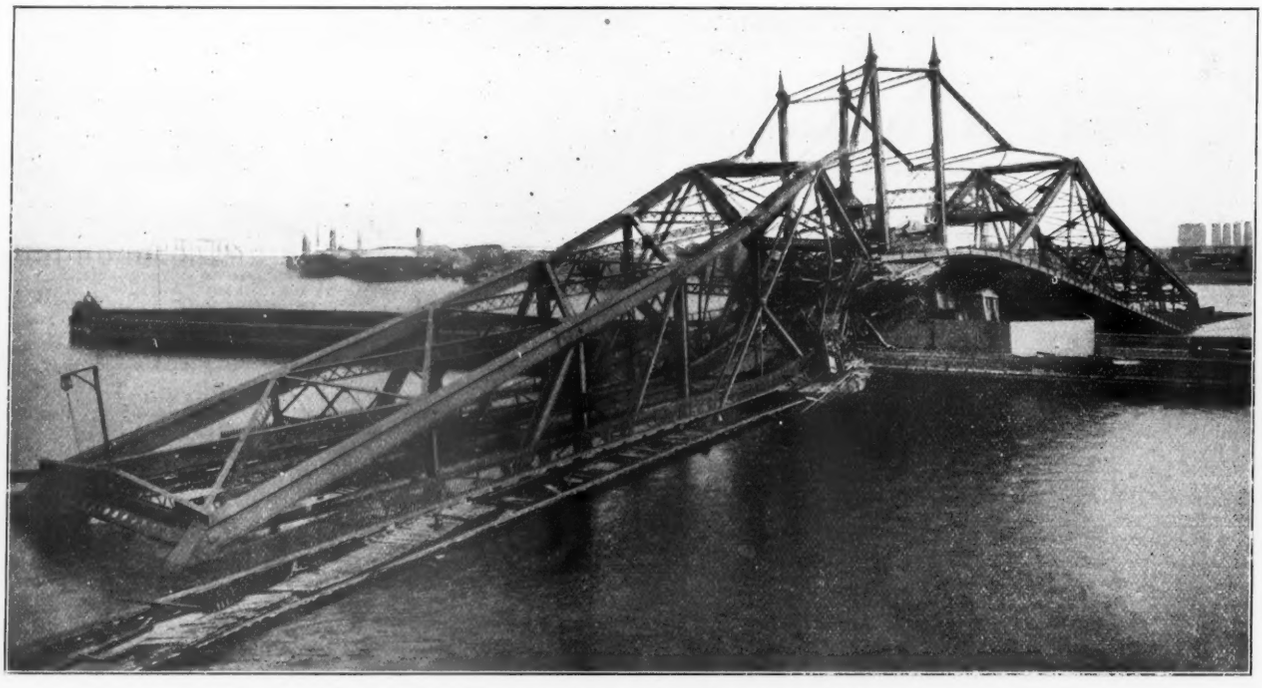
All trains to meet at a station by train order must be included in the orders, or such additional information given as may be necessary to avoid collision between trains in the same direction, or prevent a train from moving against another through misunderstanding or lack of information. To enable sections which are closely following to properly govern their movements, each must be given copies of all time orders restricting sections in advance.

When a crew is unacquainted with the division, or when necessary to move an engine without a conductor, take extra precautions, surrounding such trains with every safeguard.

Wreck of the Interstate Bridge Draw-Span.

A view is shown herewith of the wrecked draw-span of the Interstate bridge connecting Duluth, Minn., and West Superior, Wis., the result of a collision with a large package freighter on August 10. As is plainly seen in the view, the boat struck the bottom chord of the first panel on the near side of the pivot pier, smashing same and causing the entire span to collapse. The force of the shock also displaced the span from the turntable. The draw-span is one of the largest ever built, being 493 ft. long and 58 ft. wide over all. The structure carried four tracks and the steel work in the whole bridge weighed about 2,500,000 lbs. The bridge also has two fixed spans 300 ft. long. The draw opening allowed two waterways 200 ft. wide in the clear. The bridge was designed by Mr. A. P. Boller, M. Am. Soc. C. E., New York, and was opened in the summer of 1897. It belongs to the Great Northern R. R. and was used for both steam and street railroad and highway traffic.

The wrecking of the bridge closed the channel, of course, causing a suspension of commerce, a number of vessels, both freight and passenger, being shut up in the harbor. To attempt to open the channel by removal of the disabled draw-span would have meant an indefinite delay, so it was decided to remove instead one of the fixed spans—the one directly south of the draw, which is the Wisconsin side. This was done by means of four scows which were sunk beneath the span, a timber cribbing built up on them and the water then pumped out. The span was floated to a temporary pile support, navigation being resumed on the afternoon of August 13. It is estimated that the bridge cannot be restored in less than a year. The traffic carried by the bridge is being conducted by ferries.



The Wrecked Draw-Span of the Interstate Bridge.

Foreign Railroad Notes.

An Austrian car works exhibits at Milan a street car intended to be rented by the day to private parties, just as special private street cars are rented in this country.

After extensive experiments, the government of Bavaria has decided to equip railroad trains with wireless telegraphy. On one of the tests a message was transmitted to the Minister of Railroads, who was on a train, from Berlin, 200 miles away.

It is reported from St. Petersburg that an official inquiry at Tomsk into the conduct of the Siberian Railway during the war has brought to light the fact that the government was at one station alone defrauded of $350,000, and that on the whole line some 1,500 cars disappeared.

Score one for France! On the Orleans Railroad, in each car of an express train which leaves Paris at 9:49 a. m. the despatches of the Associated Press, or what answers to it in France, are posted, and again at Poitiers at 2 p. m., so that on arriving at Bordeaux at 5 the passengers need not buy an evening paper.

Iron and Steel Production.

The following comparative statistics of iron and steel production in the United States in 1905 and 1904 are taken from the Annual Statistical Report of the American Iron and Steel Association.

The production of all kinds of pig iron by states in 1904 and 1905, according to their rank in each year, was as follows:

States.	1905. Rank.	1905. Gross tons.	1905. Per cent.	States.	1904. Rank.	1904. Gross tons.	1904. Per cent.
Pennsylvania ..	1	10,579,127	46.01	Pennsylvania ..	1	7,644,321	46.34
Ohio	2	4,586,110	19.95	Ohio	2	2,977,929	18.05
Illinois	3	2,034,483	8.85	Illinois	3	1,655,991	10.04
Alabama	4	1,604,062	6.98	Alabama	4	1,453,513	8.81
New York	5	1,198,068	5.21	New York	5	605,709	3.67
Virginia	6	510,210	2.22	Virginia	6	310,526	1.88
Missouri ..... Colorado	7	407,774	1.77	Tennessee	7	302,096	1.83
Tennessee	8	372,692	1.62	Maryland	8	293,441	1.78
Wisconsin .... Minnesota	9	351,415	1.53	West Virginia..	9	270,945	1.64
Maryland	10	332,096	1.44	New Jersey ...	10	262,294	1.59
New Jersey ...	11	311,039	1.35	Michigan	11	233,225	1.41
West Virginia..	12	298,179	1.30	Wisconsin .... Minnesota	12	210,404	1.28
Michigan	13	288,705	1.26	Missouri ..... Colorado	13	151,776	.92
Kentucky	14	63,735	.28	Georgia ..... Texas	14	75,686	.46
Georgia ..... Texas	15	38,699	.17	Kentucky	15	37,106	.23
Connecticut ...	16	12,521	.05	Connecticut ...	16	8,922	.05
Massachusetts .	17	3,466	.01	Massachusetts .	17	3,149	.02
Total		22,992,380	100.00	Total		16,497,033	100.00

The following table gives separately the production of Bessemer ingots and castings since 1898, all made by the acid process. Prior to 1898 Bessemer castings were included with ingots. Basic Bessemer steel has not been made in this country since 1897.

Year.	Gross tons. Ingots.	Gross tons. Castings.	Gross tons. Total.
1898	6,605,478	3,539	6,609,017
1899	7,582,415	2,939	7,586,354
1900	6,678,303	6,467	6,684,770
1901	8,706,538	6,764	8,713,302
1902	9,125,815	12,548	9,138,363
1903	8,574,730	18,099	8,592,829
1904	7,843,089	16,051	7,859,140
1905	10,919,272	22,103	10,941,375

The production of all kinds of rails in 1905 amounted to 3,375,929 tons, against 2,284,711 tons in 1904, an increase of 1,091,218 tons, or 47.7 per cent. The maximum production was reached in 1905. The year of next largest production was 1903, when 2,992,477 tons were rolled. The increase in 1905 over 1903 amounted to 383,452 tons, or over 12.8 per cent. Rails rolled from purchased blooms, crop ends and "seconds," and rerolled, or renewed, rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. In the following table the production of all kinds of rails in 1905 is given by states, in gross tons, followed by the total annual production since 1897.

	Gross tons. Bessemer.	Gross tons. Open-hearth.	Gross tons. Iron.	Gross tons. Total.
Pennsylvania	1,097,154	18,687	.....	1,115,841
Other states	2,095,193	164,577	318	2,260,088
Total for 1905	3,192,347	183,264	318	3,375,929
Total for 1904	2,137,957	145,883	871	2,284,711
" " 1903	2,946,756	45,054	667	2,992,477
" " 1902	2,933,392	6,029	6,512	2,947,933
" " 1901	2,870,816	2,093	1,730	2,874,639
" " 1900	2,383,654	1,333	695	2,385,682
" " 1899	2,270,585	523	1,592	2,272,700
" " 1898	1,976,702	1,220	3,319	1,981,241
" " 1897	1,644,520	500	2,872	1,647,892

The Government Railroad Monopoly in Italy.

III.

BY ING. COMM. GIUSEPPE SPERA.

When the Italian government took over the management of the two great Mediterranean and Sicilian railroad systems, it left unsettled the yet more serious problem of the repurchase of the Adriatic railroad system, owned largely by the Southern Railroad Company.

But if, as we have said, the government was unlucky in taking its first step in this direction, owing to its lack of preparation and to the character of its agent, the man who rose from the position of a mediocre civil servant to that of Minister of Public Works, bringing to the discharge of his new duties all the defects of a bureaucrat and none of the qualities of a statesman, it has had better luck in the solution of the much more difficult and complex problem of the repurchase of the Southern Railroads.

This is due not only to greater forethought on its part, and to the longer study given to the question, but more especially to the competent and enlightened men who have dealt with it. The negotiations with the company were long, and were renewed on three occasions, owing to the political vicissitudes which in a short period called three different men to the supreme direction of the Ministry of Public Works, Ferraris, Carmine and Gianturco. The real solution of the problem was, however, bound by the two last; by Engineer Carmine, a talented man equipppd with a thorough understanding of railroad questions, and by Prof. Gianturco, the famous jurist, a man of keen and versatile intellect, one of the most illustrious men of Italy.

Useful and enlightened assistance has also been given in this great undertaking by two talented engineers, the Manager General of the State Railroads, Engineer Bianchi, who showed consummate skill in overcoming the enormous difficulties involved in taking over the management of the railroads at a most critical moment and under most unsatisfactory conditions; and Engineer Rava, one of our finest civil engineers, who combines technical knowledge with an exceptionally wide and modern culture, and a clear insight into the problems connected with the economic revival of Italy.

The repurchase of the Adriatic railroad system presented a complex problem. The Italian Southern Railroads Company ran the Adriatic system, which was composed as follows:

	Miles.
Lines granted to the Italian Southern Railroad Co. by laws and concessions prior to 1888	1,070
Lines granted to the company by the law of July 20, 1888, No. 5550 (3d series) and of July 2, No. 269.	280
Lines granted to several companies but managed by Adriatic Company	101
Total	1,451

Besides these, the Southern Railroad Company had obtained a further grant of 65 miles by laws prior to 1888, but this mileage had been leased to the Mediterranean Company.

In the case of the railroad concessions granted by laws made before 1888, the government undertook to pay $6,838,070 annually to the companies, to whom the concessions had been granted for the whole durations of the lease, that is to say, until December 31, 1951, for a small portion of these lines, and until December 31, 1966, for the balance.

In the case of railroad concessions granted by the law of July 20, 1888, the subvention amounted to $1,725,901, until December 31, 1966, besides $30,940 for works carried out along the Po by the company.

By the terms of the concession the government could reacquire possession by the payment to the company of an annual grant till the expiration of the lease, to be calculated on the net annual income for the last seven years, from which were to be deducted the receipts for the least profitable years.

The concession, sanctioned by the law of April 27, 1885, No. 3048, which divided the Italian Railroads into three great systems, the Mediterranean, the Adriatic and the Sicilian, contained a clause by which, on the expiration of this concession, its fundamental conditions could only be applied after a lapse of seven years, that is to say, on the 1st of July, 1912.

Moreover, the terms of the concession made in 1885 settled that the government was to pay to the Adriatic Company, first, the subvention for the lines granted before 1888, $6,162,095, instead of $6,838,070, as the sum of $675,975 due by the company to the government was deducted therefrom, leaving intact the other subventions of $1,720,201 and $30,940.

Notice of withdrawal of the concession having been given, the contract with the companies ceased on June 31, 1905, but while the government took over the railroads belonging to the Mediterranean and Sicilian lines, it added thereto, for the needs of the service, a very small portion of the Adriatic line, and asked for a year's delay in which to settle the question of the repurchase of the Southern lines.

Meantime progressive measures were taken for ensuring the regularity of the service, and the companies were paid for the winding up of the lease the stipulated sums, to which no demur was raised. The annual subvention paid by the government to the company was taken as the basis of the future agreement.

By a preliminary agreement, dated May 15, 1905, the Adriatic Company, along with other measures of secondary importance, agreed to a reduction of $177,080 on the subvention for the lines which had received concessions before 1888, thus fixing that sum at $5,985,000. To this was added the subvention of $1,720,201 for subsequent concessions, besides the annual payment of $30,940 for other works, the other subventions above mentioned remaining unaltered. This agreement aroused in the Italian Parliament and throughout the country the most animated discussions of a political, social and financial character.

On one hand, the principal towns along the Southern Railroad lines petitioned Parliament for the speedy repurchase of those lines, since private railroad service was injurious to their interests now that the government controlled the lines in other parts of Italy.

Similar claims were urged by the railroad employees of the Southern lines, who were extremely anxious to enter the service of the government. The political parties in the country, each from its own special point of view, discussed the question, supporting or combatting the idea of a government monopoly, and finally the Parliamentary Commission itself, appointed to study the scheme of repurchase, divided up into a majority and a minority, the former favoring the repurchase on the terms fixed by the agreement between the government and the companies, the latter opposing it as imposing excessive burdens on the state. The majority in the Commission, looking upon the agreement from a purely financial point of view, simplified the matter by asking itself whether the annual payments which the government would

have to make, should it not repurchase the Southern lines, would be heavier or lighter than those it would have to meet if the purchase were made on the proposed terms. The calculations of the Commission showed that by making the purchase the government would reduce its obligations by nearly $190,000 a year.

On the other hand, the minority in the Commission, taking into consideration a number of circumstances, came to a diametrically opposite conclusion, according to the minority the government by concluding this purchase would have to meet an annual loss of $2,195,261.

Meantime the government, after several ministerial crises, managed, in the course of subsequent negotiations, to reduce the subvention by another $190,000, and later on a further reduction of $95,000 was agreed to, so that the annual subvention for the railroad lines leased before 1888 was reduced to $5,700,000 for the remainder of the lease, that is to say, in most cases, till December 30, 1966. The other articles of the previous agreements were then integrally confirmed. Among these, the agreement by which the employees of the Southern lines, with the exception of those who remained in its service—for the company did not wind up—are taken over by the government from July 1, 1906, confirming the positions and wages in force on March 1, 1906, is of special interest.

This agreement finally obtained the sanction of both Houses of Parliament, certainly not because they were convinced of its intrinsic excellence, but because it was looked upon as an inevitable financial necessity, for in view of the conditions of the Italian railroads it would have been an unpardonable error to stop half way. The principal of a government railroad monopoly having been accepted and being already in force on a great many lines, it would have been an abnormal and absurd state of affairs to continue private operation on the others, and so the repurchase of the important southern lines became a necessity to which all other considerations were quite secondary. The winding-up of the Southern Railroads Company, that is to say, the final settlement of many points, is certainly not yet concluded, and will offer many difficulties, but for these also a solution will undoubtedly be found, because of the clear headed way in which the problem is being met.

And it is on the well-balanced national mind that reliance must ultimately be placed, for though the government now owns a railroad monopoly, the present railroad administration has all the characteristics of a temporary makeshift. A law is needed to fix the limits and conditions of the new and important service, which we wish to see quite autonomous, but which now has to face difficulties on all sides arising from defects in the administrative laws of the country; a law is needed to establish a real and rational working plan, and while all those measures which should guide the administrative working of the railroads are lacking, these latter are not only in need of renovation in view of their present insufficiency, but also require a deep and radical modification of their technical and financial basis, which to-day is far from corresponding to that which the country has a right to expect, after so many financial sacrifices and such long and harmful delays.

Accident Bulletin No. 19.

The Interstate Commerce Commission has issued Accident Bulletin No. 19, giving the record of railroad accidents in the United States during the three months ending March 31, 1906. The number of persons killed in train accidents was 274, and of injured 3,969. The total number of casualties from train accidents and other causes was 18,296 (1,126 killed and 17,170 injured). These accidents are classified in the following table. These reports deal only with (*a*) passengers and (*b*) employees on duty.*

Table No. 1.—*Casualties to Persons.*

	Passengers—Classes *a* and *b*.		Passengers—Class *bb*.		Employees.		Total persons reported.	
	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.	Kil'd.	Inj'd.
Collisions	46	939	10	108	127	1,197	183	2,244
Derailments	2	628	3	118	70	564	75	1,310
Misc. train accidents	..	10	1	5	15	400	16	415
Total train accidents.	48	1,577	14	231	212	2,161	274	3,969
Coupling or uncoupling	..	.....	..	..	84	983	84	983
While doing other work	..	.....	..	..	87	4,116	87	4,116
Contact overhd bridges,&c	1	3	1	1	33	368	35	372
Falling off or getting on	31	396	1	11	187	3,089	219	3,496
Other causes	16	400	2	48	409	3,786	427	4,234
Total, other accidents	48	799	4	60	800	12,342	852	13,201
Total, all classes	96	2,376	18	291	1,012	14,503	1,126	17,170

The number of casualties in the quarter under review is large. As in Bulletin 18, the increases over the totals for the corresponding quarter of the preceding year are nearly all very large. . . . The worst accident in the present quarter's record, collision No. 29, Table 2*a*, causing 34 deaths and 24 injuries, was due to a striking failure of the train-despatching system. A telegraph operator at a small and lonely station who had been on duty all day and more than half the night fell asleep, and, on awakening, misinformed the train despatcher as to what had occurred while he had slept. On some railroads the train-despatching rules require that the telegraph operator's train-order signal shall always be set to indicate "stop" except when, on the approach of a train, the operator, by pulling a lever or a cord, changes it to the "proceed" position. This rule is designed to insure that no train shall pass a station except when the operator at that station is awake and attentive to duty. This rule was not in force at this place. It is sometimes advocated that the superior train—the one which by the order is to have its right to the track abridged—must receive the order and acknowledge its receipt in writing before the order is delivered to the opposing or inferior train. Neither of these ideas finds universal acceptance, however; and, in view of the differences of opinion among railroad officers on the points involved, and on other details of train despatching, it is pertinent to observe that the block-system, repeatedly advocated by the Commission, is the true means that ought to be adopted for the prevention of such distressing disasters as that here recorded. The report of collision No. 8 includes an example of flagrantly excessive working hours.

*In Table No. 1 the passengers have been divided into three classes. Class *a* includes all ordinary passengers. Class *b* includes passengers traveling on freight trains. Class *bb* includes postal clerks, and express messengers, employees on Pullman cars, newsboys, men in charge of freight, etc.

Table No. 2.—*Collisions and Derailments.*

	No.	Loss.	Persons—Killed.	Persons—Injured.
Collisions, rear	504	$492,741	42	675
" butting	240	515,330	92	819
" trains separating	223	77,325	2	106
" miscellaneous.	954	432,147	47	644
Total	1,921	1,517,543	183	2,244
Derailments: Due to defects in roadway, etc	356	$267,477	7	465
Due to defects of equipment	647	579,478	11	235
" negligence of trainmen, etc	96	59,161	6	81
" unforeseen obstructions	96	192,738	29	179
" malicious obstructions, etc	12	8,486	1	12
" miscellaneous causes	362	299,902	21	338
Total	1,569	1,407,242	75	1,310
Total collisions and derailments	3,490	2,924,785	258	3,554

Table No. 2*a* is a list of train accidents in which the damage is reported at $10,000 or over; notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

Table 2*a*.—*Causes of Forty-six Prominent Train Accidents (Class A).*

[Note.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

					COLLISIONS.		
No.	Class.	Kind of train.	Killed.	Injured.	Damage to engine, cars & roadway.	Reference to record.	Cause.
1	B.	P. & F.	1	36	$2,260	8	Freight stalled in snow; terrible wind and storm; flags and torpedoes failed to attract attention of engineman of passenger train.
2	B.	F. & F.	3	6	2,695	71	Conductor of train running north on southbound track failed to arrange for protection; flagman mismanaged when conductor was absent; engineman failed to test air-brakes; block-signal operator gave false clear signal.
3	R.	P. & F.	0	0	2,700	30	Milk train disregarded block signal; engineman discharged; conductor of standing freight train discharged for not flagging; fireman suspended for failing to observe fixed-signal indication.
4	B.	P. & F.	0	11	3,000	10	Men in charge passenger train failed to correctly identify freight standing on sidetrack; occurred in daylight.
5	B.	P. & F.	1	0	3,200	67	Occurred in blizzard 4 a. m.; telegraphic communication being interrupted, trainmaster gave orders by telephone. (See note in text below.)
6	B.	F. & F.	1	0	3,635	13	Operator accepted meeting order after train addressed had passed his station; occurred 5 a. m.
7	R.	F. & F.	0	6	4,400	59	Engineman asleep; other members of crew neglected to notice that he approached station too fast; all these men on duty 15½ hours.
7*a*	B.	P. & P.	0	49	4,832	61	Engineman overlooked or confused orders. (See note in text below.)
7*b*	R.	P. & F.	0	40	5,000	1	Block-signal man went off duty without giving proper information to his successor.
8	R.	F. & F.	0	3	5,440	31	Runaway on steep grade; engineman and fireman asleep; both on duty long hours. (See note in text below.)
9	B.	F. & F.	2	3	5,800	12	Despatcher, 18 months' experience, on duty 5 hours, gave meeting order first to inferior train and forgot to hold the superior.
10	R.	F. & F.	0	0	6,000	32	Excessive speed under permissive signaling.
11	M.	P. & P.	1	12	6,245	41	Train of empty passenger cars in yard disregarded stop signal; crossing collision; one passenger in smoking car killed.
12	B.	F. & D.	0	2	7,442	14	Mistake in identifying extra train standing on sidetrack.
13	R.	P. & P.	5	4	9,400	28	Runaway train; engineman and fireman driven from cab by steam from burst injector pipe; brakeman opened conductor's valve, but too late.
14	R.	F. & F.	0	2	9,900	57	Standing train not protected; approaching train not under control;

No.	Class.	Kind of train.	Killed.	Injured.	Damage to engine, cars & roadway.	Reference to record.	Cause.
							wreck led to derailment No. 15. (See below.)
15	B.	F. & F.	1	3	10,002	72	Conductor and engineman eastbound receiving order to meet west bound No. 35 proceeded to execute it with such exclusive attention that they forgot an order previously received to meet No. 71.
16	M.	F. & F.	1	0	11,000	100	Runaway on descending grade; train consisted of 25 cars air-braked and 9 not air-braked, with two engines.
17	B.	P. & P.	3	29	12,191	34	Northbound train running 15 minutes late by despatcher's orders failed to wait 3 minutes at meeting station, as per rule.
18	B.	P. & P.	1	18	13,000	35	Conductor and engineman southbound, reading register, failed to note that opposing northbound train had carried green signals.
19	B.	P. & F.	3	20	14,000	9	Engineman of empty engine forgot schedule of passenger train.
20	B.	P. & F.	3	12	14,000	37	Conductor and engineman of freight neglected to identify passenger train at meeting point.
21	R.	F. & P.	5	5	15,000	29	Runaway freight cars; had been left standing on grade with only air-brakes to hold them; men in charge of train on duty 15½ hours.
22	M.	P. & F.	1	7	16,789	43	Cars of freight train left standing on siding (1 a. m.) while engine was switching, ran out on main track and met passenger train.
23	R.	F. & F.	0	0	17,000	3	Air-brakes ineffective; angle cock had not been opened behind third car.
24	B.	P. & P.	2	36	17,789	36	Runner of empty engine miscalculated time and place to meet opposing passenger train.
25	B.	P. & F.	4	18	18,000	6	Signalman gave false clear block signal. (See note in text below.)
26	B.	P. & P.	1	39	19,630	62	Agent and operator failed to deliver order to eastbound train; operator, 27 years old, 2 months' experience, went off duty without informing agent that there were orders to deliver to 2 trains; agent delivered to only 1 train.
27	B.	P. & P.	3	8	20,000	5	Eastbound train ran past meeting point; engineman forgot order; conductor, taking up tickets, discovered engineman's error, but not soon enough.
28	B.	F. & F.	3	3	27,000	70	Engineman westbound forgot about one of two eastbound trains he was to meet; conductor and two brakemen slept while waiting at meeting point and assumed engineman had waited for two trains.
29	B.	P. & P.	34	24	51,249	63	Operator, 2 a.m., on duty 19 hours; accepted order after train had passed. (See note in text below.)
Total.....			79	396	$358,599		
					DERAILMENTS.		
1	D.	P.	1	2	$2,000	19	Movable-point frog out of place, rod having been broken; signalman held blameworthy for not having discovered fault by lightening of load on lever.
2	D.	P.	0	0	2,100	25	Switch maliciously misplaced; speed of train, 65 miles an hour, yet no injuries reported.
3	B.	F.	0	0	2,300	24	Broken wheel, due to sticking of brake, caused by defect in triple valve.
4	D.	P.	0	40	2,500	95	Unexplained; speed 35 miles an hour; 3 cars overturned.
5	D.	F.	10	17	2,500	92	Work-train carrying laborers derailed at culvert washed out by flood. Water in creek was raised suddenly by melting snow; ice gorge filled opening beneath track, and water then found its way to culvert 1,000 ft. east of bridge.
6	D.	F.	1	1	3,732	82	Worn tires on driving wheels of engine, combined with slight overelevation of stock rail of switch.
7	D.	P.	1	28	6,512	93	Switch loosened by mail bag thrown from car, breaking switch stand.
8	D.	P.	0	25	9,917	74	Rails spread; track in "fair" condition; curve, 6°; superelevation, 6 ins.; weight of engine, 87½ tons; speed, 45 miles an hour.
9	D.	P.	0	10	10,725	91	Washout caused by river changing its course after a rain storm; engineman was not properly observing slow order.
10	D.	P.	0	48	11,735	76	Broken rail; internal defect.
11	D.	P.	0	5	13,500	47	Unexplained.
12	D.	P.	3	5	16,600	89	Washout.
13	D.	F.	0	5	17,500	49	Runaway on 3½ per cent. descending grade; train of 52 cars was started from summit too rapidly; engineman's experience, 4 years as fireman and 2 months as engineman.
14	D.	P.	2	2	18,800	88	Occurred 11 a. m.; burned bridge.
15	D.	P.	2	20	42,700	87	Accidental obstruction; westbound track obstructed by wreck due to rear collision a moment before on eastbound track. (See collision No. 14.)
Total.....			20	208	$163,121		
Grand total.			99	604	$521,720		

Collision No. 29, causing the death of 31 passengers and a money loss (besides the damages paid on account of deaths and personal injuries) of over $50,000, was due to the non-delivery of a meeting order sent by the train despatcher. The collision occurred about 2 a.m., and a blinding snowstorm prevailed at the time. Immediately after the collision the wreck took fire, and eight cars—passenger, mail and baggage—were burned up. A portion of the deaths were caused by the fire. The westbound train ran past the meeting point which had been fixed by the despatcher, for the reason, as before stated, that the meeting order was not delivered. The westbound train, running from A to G, had been ordered to meet the eastbound at E, but it was found that the eastbound train was gaining time over the westbound, and it was decided to change the meeting point to D, and an order to this effect was sent to the eastbound train at F and to the westbound at C. The non-delivery of the order was due to the fact that the telegraph operator at C accepted it from the despatcher after the train had passed. The despatcher, depending on the station operators for knowledge as to the whereabouts of all trains, inquired of the operator at C if the westbound train (No. 3) had passed. The operator replied that it had not, and the despatcher at once instructed him to display his stop signal. But it turned out that the train had passed while the operator had been asleep, and the information given by him to the despatcher after he awoke was, therefore, false. This operator had been on duty all day the day before, and then served at night in place of the regular night operator—19 hours in all, except for the time occupied at meals. It is estimated that he had been asleep only about one minute. He had worked an excessive length of time to accommodate his fellow-operator and without the permission or knowledge of his superintendent. He had been in service at C one week, for this company two months, and for other companies nearly two years. He is reported as being proficient and habitually attentive to duty.

Collision No. 6 was due to practically the same cause as No. 29.

Collision No. 5, occurring at 4 a.m. in a severe blizzard, was due to a mistake in conveying orders over a telephone line. Communication with the despatcher's office had been cut off, and the trainmaster, a despatcher of 25 years' experience, telephoned to the engineman of the superior (passenger) train to stop at H for orders, but the engineman did not so understand the message and proceeded beyond the point where the orders were to be delivered and where he was to have met the opposing train. The trainmaster asserts that he got a response "all right," spoken twice; but he did not cause his order to be written down by the engineman, nor did he have it repeated or delivered to the conductor of the train. Having got his worthless "all right" from the engineman, he sent the order in regular form to the inferior train.

Collision No. 7*a* appears to have been due to a confusion of despatcher's orders on the part of an engineman, and is notable as illustrating the failure of a safeguard which has come into use within recent years, the safeguard of requiring the conductor of a train to notify the engineman on approaching a meeting point. In the present case this notification was given, but did not produce the intended result. Eastbound trains ordinarily have the right of track over westbound; but in this case the westbound passenger train had been made superior to eastbound trains for about 58 miles. At D, within this district, the westbound train received orders to wait at C until 9.15 p.m. The eastbound train therefore had right of track to C until that hour, or until such time as it should be able to reach the side track C and get out of the way of the westbound train; but there was also a westbound freight train waiting at C, and the eastbound train had orders to wait at C until 9.05 p.m. for this freight.

The eastbound train came on at 9.10 p.m., and having fulfilled the order as regards the freight train had no other train to look out for except the westbound passenger. The westbound passenger was at a standstill about 600 ft. east of the west switch, and with this standing train the eastbound train collided. It would appear that the engineman of the eastbound forgot entirely about the westbound passenger train or mistakenly calculated that he was to meet it at another station farther east. He asserted that the air-brake pipe had been closed back of the second car of his train, and that this was the cause of his approaching the station at high speed, but the officers of the road reject this explanation. The station next east of C was the usual meeting point for the two passenger trains. The conductor of No. 2, on approaching C, gave the proper signal by air whistle to remind the engineman that C was a meeting point; but it is believed that the engineman took this as applying to his order to wait for the freight. He acknowledged the conductor's signal, but did not make the reduction of speed which it required. The signal given by the conductor conveyed no information as to what or how many trains were to be met at that station and therefore did not provide for the contingency of an engineman's forgetfulness as to how many trains he was to look out for at a given point. This engineman had been in the service 20 years.

In collision No. 7*b* 40 passengers were injured, most of them not very seriously, by a combination of neglects, failures and unfavorable circumstances. The train was a special, occupied by a company of firemen being taken home after extinguishing a fire. The train (two cars) was being pushed from a side track to the main track, when it was struck by a through freight train. The conductor of the special had instructed a block signalman to pro-

tect this switching movement, but the signalman went off duty without informing the man who relieved him, and this man allowed the through freight train to proceed. The conductor of the passenger train threw a lever to put in the stop position a semaphore signal connected with the switch at which he was at work; but this signal did not move to the stop position, for the reason, it is said, that a wire controlling it had been lengthened by the heat from the fire, which had been raging near by. The conductor and the engineman of the special passenger train, as well as the signalman, were dismissed, as it was their duty under the rules to send back a flagman, notwithstanding the arrangement with the block signalman.

Collision No. 8 was due to a freight train running uncontrolled on a steep grade in consequence of both the engineman and the fireman falling asleep. This fireman had been in the service only one month, but the engineman had had long experience. Both of these men had worked very unreasonably long hours. Taking the engineman's record from the third day before the collision, his periods on and off duty were as follows: Off 13 hours, on 14½ hours: off 4½ hours, on 14 hours; off 4½ hours, on 22 hours; off 4 hours and on 10½ hours at the time of the collision. It is to be observed that this is the record as shown on the call books. The short periods off duty could not be availed of entirely for sleep. The report says that after the 22-hour tour of work the engineman requested that he be called for a certain train, this for the purpose of reaching his home sooner (and he was thus called), and that he could have been relieved by another engineman if he had made a request to that effect.

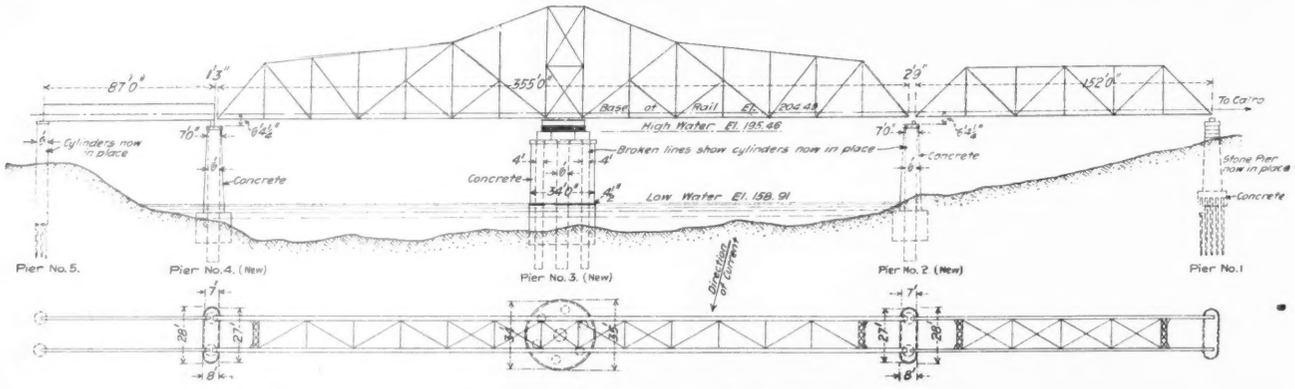
Collision No. 17 was due to a misunderstanding or neglect concerning the time at which a southbound train should clear the track for a northbound. The northbound train, due at B at 3.54 p.m., was authorized to run 15 minutes late, or to leave B at 4.09. The southbound train, due at B at 4.04, was behind time, but the conductor and engineman were aiming to reach the station at 4.09. These men assert that the collision, which occurred at a point about 1,000 ft. north of the station, happened at about 4.08, and though the evidence is conflicting the preponderance is in favor of this statement. The northbound train, however, should have waited at the station, if necessary, until 4.12, as, according to a regular rule, a stop of three minutes should have been made, if necessary, to allow for a possible error on the part of the men in charge of the southbound train. This three-minute rule applied not only at schedule meeting stations, but to meeting stations made by train despatchers' special orders.

Collision No. 25 was due to the gross negligence of a block signalman, an engineman, and a conductor, and the contributory negligence of several other employees. The collision was between eastbound passenger train No. 2 and westbound freight train No. 7, both running at full speed. The wreck took fire and three cars were burned up. These trains had both been ordered by the train despatcher to meet at B, but No. 2 passed B, and the collision occurred between B and A. No. 7 was allowed to proceed from A to B by reason of the negligence of the signalman at A, who set his signal in the "proceed" position and subsequently fell asleep. The eastbound train passed B because the block signal at that station was cleared for it, no information having been received from A concerning train No. 7, and because both the engineman and the conductor of train No. 2 carelessly assumed that train No. 9, standing on the side track at that station, was No. 7, the one which they were to meet. The engineman of the eastbound train was killed.

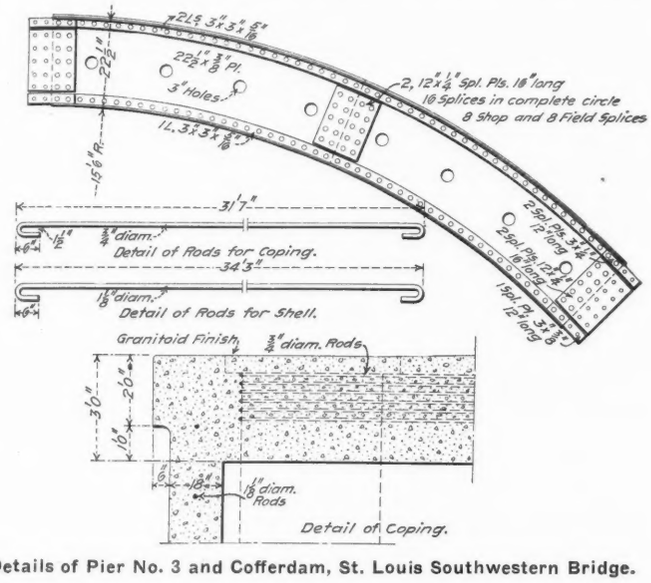
The conductor evidently took no pains to identify the train on the side track. The signal for eastbound trains at B was in the proceed position, because no communication had been received from the block-signal operator at A, and because the meeting order for the trains had not been sent to B. The signalman at A was employed as brakeman five years ago; he lost an arm three years ago and was then employed as signalman. Communication from station to station was by telephone. The report says that this signalman had been on duty 11 hours, after a suitable period of rest. Although this signalman was primarily at fault for permitting the westbound train to pass A, the engineman of that train is also blameworthy, for under the rule he should not have accepted a clear signal unless he saw the signal moved from the stop to the clear position. This rule he disregarded and accepted an all-right signal which had been set at "all right" by the signalman some time before.

A Novel Method of Cylinder Pier Reinforcement.

There has recently come to our notice a novel method of strengthening, or increasing the stability of old cylinder piers on a bridge in Arkansas of the St. Louis Southwestern Railroad which is quite interesting, and although done last year, has never been described, so far as we know. The bridge is the White river crossing of the road at Clarendon and was built originally in 1882 for a narrow gage track. About ten years later the superstructure was replaced by one of modern design and carrying standard gage track, the substructure, however, remaining as before. A plan and elevation of the bridge, which contains a 355-ft. draw span, are shown herewith, from which it will be seen that there were five cylinder piers (No. 1 was subsequently replaced with stone), all but the pivot pier being formed of 6 ft. twin cylinders. Pier No. 3, the pivot pier, was composed of six 4 ft. cylinders surrounding a central 6-ft. cylinder.



Repairs to St. Louis Southwestern Bridge at Clarendon, Ark.



Details of Pier No. 3 and Cofferdam, St. Louis Southwestern Bridge.

The bridge was originally designed for Cooper's Class A loading. But as the weights of cars and locomotives increased the piers manifested evidences of instability under the heavier loadings, finally reaching a point where the vibrations became seriously objectionable, necessitating resort to some method of strengthening or reinforcing the principal piers—Nos. 2, 3 and 4. The devising of a plan for doing this was entrusted to Mr. J. W. Schaub, Consulting Engineer, Chicago.

The plan adopted for the smaller piers—Nos. 2 and 4—is evident from reference to the plan and elevation views. The two cylinders were simply enclosed in a solid concrete pier which is

founded on an 18 ft. x 36 ft. concrete cofferdam, the size of the enlarged pier being 7 ft. x 27 ft. under the coping. The original bridge seats were not disturbed, the top of the coping coming flush with these.

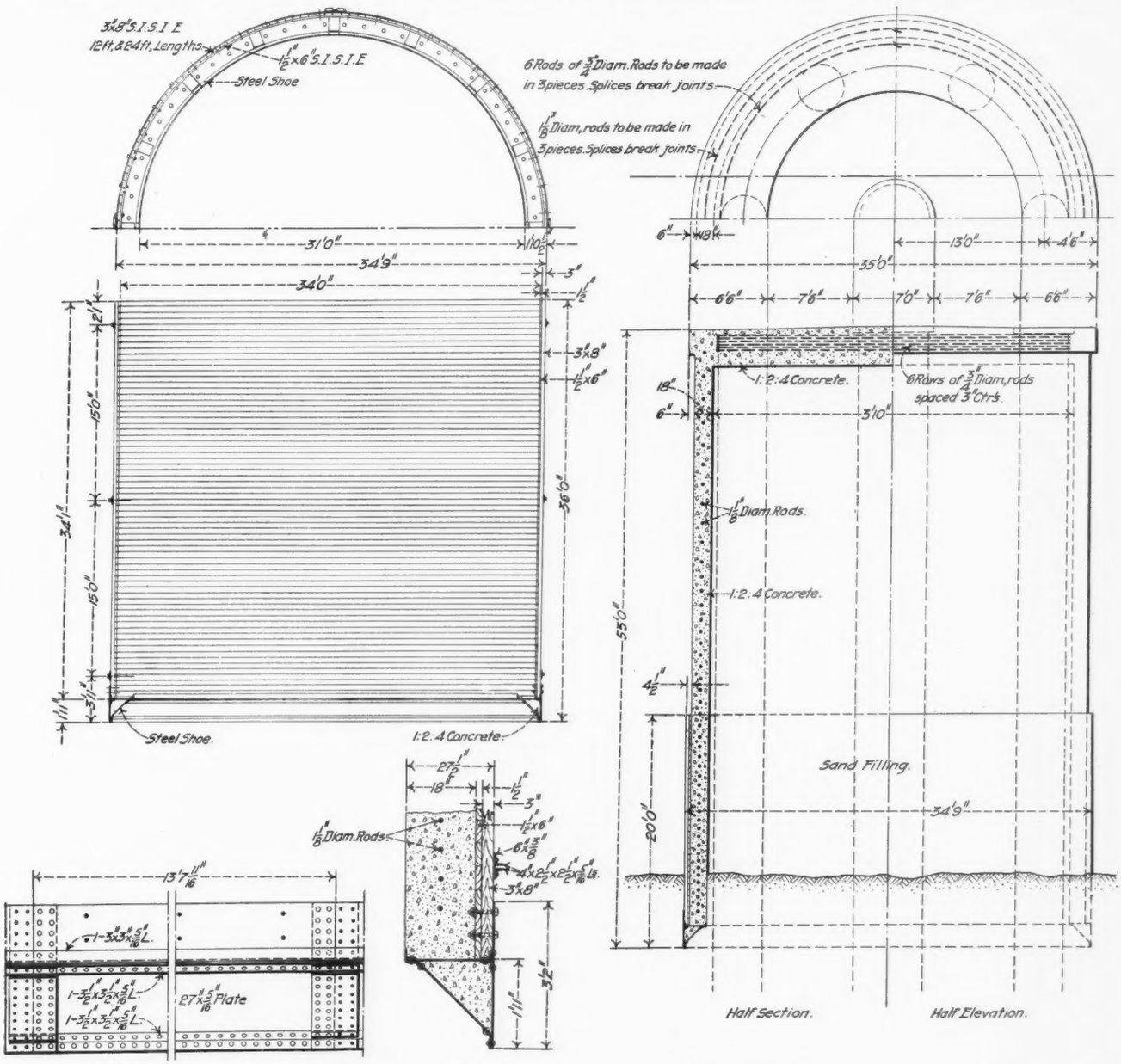
The interesting work was in connection with the pivot pier. As with the smaller piers, the bridge seats here were left undisturbed, thereby avoiding the use of falsework and also disturbance to traffic. The cylinders were to continue carrying the load, it being necessary only to provide the requisite stability. As noted on the drawings, the penetration of the cylinders was not known; neither was the exact character and condition of their filling. However, these were not factors of any great importance in the problem.

Instead of the usual sheet-piling cofferdam, Mr. Schaub concluded that the driving of this piling could be avoided and the cofferdam made a part of his pier instead. His scheme for doing this is illustrated in detail herewith. It involves the use of a circular cofferdam of reinforced concrete sunk to a depth of approximately 8 ft. below the river bed. The wooden dam or outer form for the concrete, with the steel shoe, was assembled around the cylinder pier. The shoe has 16 splices in the complete circle, eight of which were field splices. The upper or wooden portion was formed of 3 in. x 8 in. staves to which an interior lagging of 1½ x 6 in. material was nailed, the whole being held on the outside by three bands with provision for tightening. This cofferdam was 34 ft. inside diameter, 34 ft. 9 in. outside and 36 ft. high at completion. At time of assembling, the height was 9 ft., which was gradually added to as the dam sank to place. The river wall of the form was a circular wooden apron 8 ft. high, which was let down to position and remained stationary until the cofferdam, which sank as the concreting progressed, was landed in position in the river bed. The apron was then gradually raised to form the inside of the shell all the way up. The wooden dam and apron were both swung from the pier top.

A 1:2:4 concrete mixture was used throughout and time not allowed for setting before immersion. Reinforcement is by means of 1¼ in. diameter plain rods, spaced as shown. When the shell was completed the interior was filled with sand. The pier was then finished with a reinforced concrete coping having a granitoid finish on its top. As indicated, the outer wooden form was cut off at low water after the pier was completed.

The cost of the work entire was $20,000. As indicative of the relative economy of the method, another bridge of this road of similar construction and therefore in need of similar attention, was repaired several years previously to this one. The pivot pier only was strengthened and by the method used, which involved cutting off the cylinders and building thereon as foundations a new concrete pier, the cost was $25,000.

The work on the Clarendon bridge was under the supervision of Mr. J. S. Berry, Superintendent of Bridges and Buildings. It was done by force account, George C. Callahan & Co., Chicago, being the contractors.



Details of Repairs to St. Louis Southwestern Bridge Piers.

Co-operation.*

While there are about as many different kinds of co-operation as there are excuses for dodging the settlement of a claim, there are two particular kinds concerning which I propose to speak, namely: co-operation between the traffic and operating departments of the same railroad, and co-operation between a railroad on the one hand and an industry upon the other. We will first consider what may be made of co-operation between the traffic and operating departments of the same railroad, but before doing so, it is necessary to get a clear idea of the financial skeleton of the railroad in order to form some conception of the responsibility of the two departments and the joint object which demands their co-operation.

Gross earnings are the beginning of all things in railroading after the railroad is built and equipped for operation. Nothing can be paid out until something is taken in, and the difference between the two is net earnings, which become the measure of the success of the road. A railroad is a business proposition; not a Christmas tree. It is built for the purpose of making money by the sale of transportation, and the net earnings determine whether the road will advance, push its business, improve its property, and, by improved service to its patrons, become a factor in the upbuilding in the community through which it is located; or whether, on the other hand, it will shrink, lose business, deteriorate physically, and, through bad service, become a common nuisance. Let us clearly understand that there are, first, the gross earnings, then the expenses, and finally net earnings which tell the tale, and to which everything else is incidental, or a means to an end.

The traffic department gets the business. That is to say, it is responsible for the gross earnings. Gross earnings are estimated in dollars, not tons, for tonnage means nothing until it is converted into dollars. The operating department is responsible for the movement of the business, and, therefore, is necessarily responsible, in a large degree, for the expenses. Hence, the traffic and operating departments are seen to be directly responsible for, and factors in, making the net earnings. This is the same end for which they work together, or, in other words, co-operate. How many superintendents on the average railroad know each month the gross earnings of their divisions, or are able to estimate with any degree of certainty what those gross earnings are likely to be? They can usually tell how many cars have been moved, from purely an operating point of view, but the knowledge of what that movement means in cash to the company is too often lacking.

And yet, unless the gross earnings are favorable, there is a demand for retrenchment, the burden of which falls most heavily upon the operating department. The superintendent finds his clerical and agency force closely examined, his maintenance of way expenses (if that department be under his charge) forced to a minimum, improvement work, which, when completed, will reduce his operating cost, stopped, and from every side comes the demand for curtailment. The life of the superintendent, under the pressure of retrenchment, is not always a "bed of roses." Should he not for purely selfish motives, if for no other reason, do all in his power to aid the traffic department in securing business, thereby, through increased net earnings, making possible the improvement and development of the property under his charge and contributing not a little to the ease of operation?

How many division freight agents know what the expenses of their division are, and how many, if they do know, give the matter serious consideration with the view of determining to what extent there is an increased necessity on their part for discrimination in the selection of the most paying business? It is frequently a question of how many tons the freight department can secure; but what that tonnage means, when converted into dollars, is often overlooked. The best traffic officer is he who gets the most lucrative business for his road and lets his competitors compete for what is left, and how can he tell what traffic pays the best unless he has some conception of what the movement costs?

Perhaps the traffic officer deceives himself with the notion that a call for a reduction in expenses will pass him by unscathed and the operating department will carry the burden. However, do not overlook the fact that, through taking off fast but expensive merchandise runs, the task of retaining your share of competitive business grows no easier. The inability to complete additional main tracks, which will quicken the movement of traffic, leaves you, perhaps, still further behind your competitor, and the more the gross earnings fall off the harder the "boss" applies both "scourge and steel." Therefore, let the traffic officer remember, anything that affects the net earnings, whether it be a reduction in gross earnings or an increase in expenses, will bring to him, as well as to the operating officer, its train of troubles. It behooves both sides of the house to see how many dollars are taken in and how many are left after the expenses have been met, in order to form a clear idea of what each can contribute to swell the net earnings. From this viewpoint, the traffic and operating departments are exactly like a two-horse team. Unless they pull together and each hauls his share, the wagon will not move. And besides, the driver is likely to become busy with the whip and not make too fine a distinction as to which horse is at fault and failing to pull his share of the load.

Broadly speaking, railroad business is just like the grocery business, or any other business which has for its object the sale of a commodity to the public. The man who sells the best article at a reasonable rate and furnishes the best service gets the trade. We would like to haul our freight and passengers for nothing, but that would eliminate the necessity for the treasury department, and there are about a million and a half of us in this country that find that department quite useful about the first of the month. There are also some industries that find the railroads convenient in disposing of their surplus products, which might find their revenues decreasing if we stopped our purchases. For example, the railroads of the United States disburse about the following amounts annually for the various articles which they consume. These figures are for the year ending July 1, 1903. For the year ending July, 1905, they would probably be greater:

Ballast	$10,000,000
Ties	25,000,000
Rails	40,000,000
Bridges	25,000,000
Buildings	20,000,000
Materials for locomotive, freight and passenger car repairs and renewals	120,000,000
Fuel	150,000,000
Shop tools	10,000,000
In all, approximately	400,000,000

In addition to which there are paid out in wages to employees, about $660,000,000, the largest proportion of which, in time, finds its way back to the treasuries of all trades and industries. Are not the railroads of the country liberal customers, and does it not strike you that those figures represent a little concentrated sermon on the subject of co-operation from a different point of view than that we are considering, but something quite as tangible and important to the prosperity of our country?

The conduct and attitude of employees in the operating department, who come into daily contact with the shipping public, are larger factors in securing business than is often supposed. The yard conductor is just like the man who drives the delivery wagon for a grocery store. He is the man who delivers the goods. There is the driver who wipes his feet before going on the back porch, puts the goods down gently, offers to carry them to the cellar, if desired, jollies the cook, pats the dog, and wants to know if there is anything else he can do for the house. He goes on his way, leaving behind a large amount of good will and friendly feeling for his employer. There is another kind of driver that prances on to the back porch with his muddy feet, drops the goods down, breaking most of the eggs, tells the cook to get a move on and empty the potatoes, kicks the dog, and rattles down the street. Is it necessary to enlarge upon the impression the mistress of that house soon gets of that particular grocery store? You have all seen exactly the two same kinds of yard conductors; perhaps few of the former, but a lot of the latter. A yard conductor who performs his work properly about an industry and conducts himself decently, can help the solicitor who calls the next day to secure for his road a large shipment; but the yard conductor who never comes into an industry without knocking down the fence, disarranging every car in the yard, as well as dispensing a liberal amount of profanity, can lose his company more business in 15 minutes than a freight solicitor can pick up in as many days.

The same thing is true of passenger trainmen. Passenger conductors are usually promoted from freight conductors, whose training has been in handling packages and who feel that the responsibility of the company begins with receiving a package or car at the original point and getting rid of it as quickly as possible in good order at destination. They are apt to consider passengers only so many packages to be safely unloaded at the end of the journey and entitled to no greater consideration. The passenger trainmen who treat their passengers as though they were guests of the company, and as though they wanted them to come again early and often, are the men who help to put dollars in the company's treasury.

I know that I am safe in saying that the large proportion of the more important railroad officers are courteous and fair in their dealings, but we cannot escape the fact that after all, the yard conductor, the passenger conductor and the agent come more into contact with the public than any other class of railroad employees, and the public judges the railroad by the kind of men it employs in those positions. What we need in those positions are men who realize that the public spends its money where it gets the best treatment and the road that makes the most money is in position to do the best by its employees. By no means is the least responsibility of the operating department that of watching their employees to meet the public and of employing men who will not hamper the efforts of the traffic and passenger departments in securing business.

If you bought a pound of butter at your grocery, asking the dealer to send it up to the house at once, and were told that the delivery wagon would not leave until late in the afternoon, and that you would have to wait until that time, what would you think?

*A paper read before the Traffic Club of Pittsburg, by Mr. Henry W. Thornton, Superintendent Pennsylvania Lines West of Pittsburg, Newcastle, Pa.

What does the manager of an industry think whose plant is about to close down because there are some cars of much needed material in an adjacent yard which a yard engine cannot deliver because a special move is necessary? It may cost money occasionally to make special movements, but why should we be afraid to spend a trifling sum to accommodate a concern which may be paying us a large sum each month in freight charges? In chasing the present penny, do not forget the future dollar. Therefore, it is well to remember that nothing is too much trouble to accommodate the man who has the money to spend with you. Usually there are two or three hot competitors to whom he can give it, and the way he ships his freight depends largely upon the treatment he receives at the hands of the operating department. It is here that the operating department can put the traffic department in a position to get business which it would otherwise lose. Exclusive of the question of rates, the accommodation and service offered by railroads is in the hands of the operating department. You may as well rob an army of its powder and expect it to win battles as to take from the traffic department the support of the operating department and expect them to get business.

Good road service means the handling of freight expeditiously and safely. Of course, we all strive to move our freight as promptly as circumstances will permit, but sometimes it happens that an industry may be in great need of some particular car of material which has, perhaps, been delayed in transit. Possibly the fault may be with the industry in not having ordered the material soon enough, but that is not the point and has no bearing upon the matter. The industry wants the car and needs it in its business, and it is up to the railroad to get it there as quickly as possible. On railroads there are certain routine ways of tracing cars; sometimes it brings the answer and sometimes it does not. The local officers in the operating department should feel a personal responsibility in endeavoring to forward cars under such circumstances as quickly as possible, even if an especial effort is necessary. At times it is not sufficient to telegraph the car record office or turn the matter over to a subordinate. If it requires the personal attention of the trainmaster or division superintendent, the same should be cheerfully given. This is one of the things those officers are paid to do, and it brings forth fruit a hundredfold.

It is of great advantage for the local operating officers to accompany the representatives of the traffic department on their periodical visits to industries. The average operating officer is, in these strenuous times, a very busy man, but he could certainly find time to take three or four days a month in visiting the industries in his territory. It is true that the division superintendent on such expeditions may hear some disagreeable things, but the "kicker" and the critic are those who will help you improve your service. While it is very pleasant to hear that your service is satisfactory, and the knowledge of it is a spur to greater effort, at the same time he who can intelligently criticise and point out wherein your service can be improved, is the man you are looking for. Frequently there is hesitation to make known minor defects in yard and road service. They are, perhaps, not thought to be of sufficient importance to justify specific complaint, and it is only by visiting shippers in person that the operating officer is able to develop such minor points.

It is desirable that there should be a frequent consultation and exchange of ideas between the local traffic and operating officers. The yard master and the agent should co-operate to improve the service at their station. When the freight solicitor is at the division headquarters, let him call upon the trainmaster and the superintendent, and vice versa. The division superintendent and division freight agent should take advantage of every opportunity to get together and talk over their mutual interests, gaining thereby some conception of each others' difficulties.

In a territory where industries are dependent upon the railroads for a regular supply of raw material, it is necessary for the operating officer to have a fair idea of their consumption, and the conditions at various plants, in order that he may appreciate the requests of the industries as they arise, and, at the same time, determine whether such requests are reasonable. It is only by visiting plants, and through an acquaintance with their managers, that this is made possible. All of these things place the operating officer in a position to help his brother in the traffic department by giving industries such service and attention as will cause them to ship the bulk of their freight over that road.

The traffic department is especially charged with soliciting business; but there is not a man in the employ of any railroad whose co-operation with the traffic department may not have the result of steering some shipment to his line, or perhaps give the local freight solicitor a "pointer" which will enable him to secure the business. If every engineman, fireman, conductor, brakeman, supervisor and so on through the whole classification of railroad employees, was constantly upon the lookout to attract business to his road, in addition to his regularly assigned duties, would not such a spirit swell the traffic and passenger receipts of so fortunate a company? In any highly organized body, such as a large corporation, the individual is too prone to perform only his own duties, leaving his neighbor to shift for himself. It would certainly add to the gross earnings of every railroad, if every man on the payroll felt it incumbent upon him to induce his neighbors and friends to patronize his company as much as possible. And why should he not? Increases in salaries and wages may not be of common occurrence, but they are certainly not likely to be made in the face of falling earnings. This is not a wild dream, but it is a perfectly practicable proposition. For example: Smith is a yard brakeman. He lives next door to Jones. Jones is going to move to California. Perhaps a word from Smith to the freight agent, or a little missionary work on his part in the evening with Jones, will decide whether Jones will travel over Smith's road or some other line. Things of this sort are happening many times a day, and every employee of the railroad often has it in his power to direct shipments over his line. I do not know that this idea has been taken up by any road and pushed consistently, but the field seems worth the attempt.

We have seen some of the ways in which the operating department can aid the traffic department; there are also some ways in which the traffic department can lighten the burdens of the operating department. It has happened that solicitors, in their zeal to secure business, have promised utterly impossible things, or a service which, under existing circumstances, cannot be given. Solicitors should post themselves in regard to existing conditions and not promise anything which is beyond the power of the operating department to perform, and which, in the long run, hurts the solicitor in the eyes of the shipper. It is folly and unfair to promise cars for shipments when the cars cannot be obtained. It is unreasonable to ask the operating department to switch cars to connections for business off the company's lines which instructions may preclude furnishing. By a complete knowledge of the situation, which can only come through free intercourse and exchange of ideas, the traffic department can often reduce the troubles of the operating department.

Give the operating department a fair chance, and, before you decide that a delayed shipment or slow switching service is the result of pure carelessness or lack of appreciation of good business methods, find out what was the real cause. The operating department does not often hold cars in yards for the improvement of the landscape. There is generally a good (but perhaps unfortunate) cause for such things. When you congratulate yourself upon the high development of your commercial training, remember that the commercial side of the freight business does not consist in a wild scamper to secure tonnage—"any old" tonnage; but that a true commercial training never fails to count the cost. Let the competitive business you secure for the operating department to move be that business which pays the best.

It is possible, in hard times when business is dull, for the traffic department to create business, and, in this connection, I want to tell you a story which very vividly represents the possibilities along this line. It is said to be a true story. Among other things at the end of a certain railroad, there was a large ice house with a pond near by, from which the owner harvested each year a goodly crop of ice at small cost, which he sold to the summer cottages and hotels which infested those parts, at no small profit to himself. The general freight agent of this particular road, observing the ice house one day in the early spring, when it was full to the roof, asked the owner why he did not ship the ice to a large city at the other end of the railroad, to which the proprietor made reply that he had neither a siding to his ice house nor a purchaser, but he expressed a willingness to sell if a siding was provided and a buyer secured, naming his price. The general freight agent, times being dull and traffic scarce, lost no time in journeying to the large city at the other terminus of his line and arranging for the sale of the ice to a large wholesale ice cream factory, upon terms mutually advantageous to the owner of the ice and the factory. Accordingly, a siding having been put in, the ice traversed the entire length of the railroad, to the enrichment of the company.

This having been done, the ingenious traffic man bethought himself of a company engaged in the manufacture of artificial ice, also located in the large city, and inquired of the manager why he never shipped ice to the other end of the railroad where so many summer residences offered a good market. The manager explained that there was an old chap down there who harvested his ice each winter from a pond at small cost, and with whom, on this account and on account of the freight charges, the artificial ice company could not compete. Moreover, even if such were not the case, there was no place to store any quantity of ice without putting up a store house, which the profits of the business would not justify. Upon being told that the owner of the ice house had disposed of his stock, with the further assurance that a store house could be obtained at reasonable cost, the artificial ice man expressed his willingness to enter the field and ship his ice to the other end of the railroad.

The next scene opens with the general freight agent arranging with the owner of the now empty ice house for the lease of his building to the artificial ice company for the summer, and, satisfactory terms having been reached all around, back went the ice to the

other end of the line. Now, that is what I call creating traffic. You may not all have ice houses so well located but the idea remains the same.

We have seen how it is possible for the departments of a railroad to co-operate with each other. Let us see whether there may not be a degree of co-operation between railroads and industries, which may be mutually advantageous. In the first place, there should be an absolute frankness and honesty between the managers of the plants and the officers of a railroad company. If the industry is depending upon the arrival of certain cars of inbound material, do not answer an inquiry by saying that the cars will be placed the next day when you do not know whether it will be the next day or the next week. If the consignee is to be disappointed in the arrival of his material, it is very much better to tell him when it will be in, if you know, giving him an opportunity to make other arrangements, if you cannot get it to him soon enough. If he asks for a dozen or so cars to be placed at his plant for a particular shipment and is depending upon the same, do not tell him that the cars will be delivered that afternoon when you know perfectly well it is impossible to furnish any cars at all, only a proportion of what he asks. Rather than embarrass the shipper, tell him frankly what the situation is and give him an opportunity to ship his freight over another road. That may be heresy, but is the best course in the long run. It will ultimately be to the credit of your road. On the other hand, as superintendent of a plant, do not ask a division superintendent to furnish 30 cars when you only need 15, figuring that he will be compelled to cut your order through circumstances beyond his control, and by placing your requirements high enough you will get about what you really want. In time, such practices are found out and future requests are not given full weight.

In the matter of car supply, an industry local to a railroad has the right to expect that its requirements will be filled in preference to the requirements of the competitive industries which may draw their supply from more than one road. The purely local industry is absolutely dependent upon the railroad company for its facilities, and the railroad company practically decides, through the car supply furnished, what business that industry may do. Frequently it is thought that competitive business should take preference, and cars are often sent off of a company's line to other roads for switched business of this character while, perhaps, at the same time, local or non-competitive plants where you can get all the business, are suffering for cars. A railroad should consider that an industry located on its line, to which it has sole access, should receive every consideration and assistance that it can be given for the transaction and development of its business to the exclusion, if necessary, of all others. The strength of a railroad is the prosperity of its local shippers and it is suicide to sacrifice those shippers in a killing competition for other business. The railroad which pursues such a policy drives existing plants from its line and makes doubtful the location of new ones.

A railroad company endeavors to supply sufficient cars to transact its business. The number of cars it builds is based upon the amount of tonnage anticipated and the average daily movement that may be expected. It is just as much a duty on the part of an industry to unload its cars promptly as it is for a railroad company to give the cars prompt movement in road service. It is not fair to the railroad company to use those cars as store houses and, in the long run, it reacts upon the industry so doing, as it tends to reduce the general car supply. The argument that a slow road movement justifies the consignee in dilatory unloading is illogical, for two wrongs never yet made a right. A railroad company does not want the money accruing through demurrage charges. What it wants is the cars; and it is the duty of every industry to put forth every effort to release cars promptly. If such a spirit prevailed at every plant, there would be little need of car service regulations.

In laying out a new industry it is highly important that the railroad company's engineer should be consulted. Unfortunately, it often happens that an industry is built, after which the railroads are told to get to it. This is bad for the railroads and bad for the industry, for frequently the forced arrangements of tracts is such as to prevent a logical development of the plant and, moreover, switching is made slow and expensive by a bad track layout. I have in mind one plant which was laid out in opposition to the railroad company's suggestions. The result is that, in order to make a contemplated addition, it will be necessary for the plant to buy additional ground at a very high figure, while, had the original suggestions of the railroad entirely been carried out, such necessity would have been avoided.

As I have said, a railroad company should not be afraid to spend a little money to give a patron the necessary service in emergencies; so industries should not hesitate to spend a little money to help cut a railroad, especially when by so doing they are helping themselves. At a certain plant the bar between the tender and the engine broke, which would have necessitated sending the engine some distance to the shop. The manager of the plant had his own force at the blacksmith shop to repair the engine, which enabled it to switch the rest of the day; while, otherwise, the plant and the railroad would have both suffered had the engine been forced to return to the house. The occasional tank of water or bucket of sand which saves time for the shifter, will, in the long run, help the industry by avoiding the necessity of sending the engine back to the shop.

There are many little ways in which an industry can help a railroad. If a car is placed so that it is not exactly on the spot the manager of the industry wants, but so he can very well get along, and he insists upon that car being put to the inch he desires, for no apparently good reason, he has not only delayed his own switching, but he has probably made the shifter late in getting to some other indstry, with the result that, if every manager acted that way, the engines in the employ of the railroad company in yard service would never get any work done.

Our methods and practices in railroading have changed greatly in recent years. The introduction of locomotives of greater capacity, forced by the conditions of the times, has brought longer trains, more difficult to handle, which, with the equipment of cars with air-brakes and the consequent liability of sudden stoppage and rough handling, has rendered lading more liable to damage. It is reasonable for the railroads to expect that proper consideration should be given these conditions in the preparation of lading for shipment, and no shipper should forward packages which he knows are improperly protected, feeling that if they reach destination in good order, well and good, but if not the carrier will be compelled to pay his claim. The railroad is right in expecting some co-operation from the shipper in correcting such matters.

Claims should not be presented for adjustment that are not really legitimate upon the supposition that, because of the volume of traffic controlled by the claimant, an unreasonable settlement can be forced. Cars destroyed or damaged at plants by industries, through the carelessness of their employees, should be settled for upon a fair basis. Can the railroad be expected to give heed to the claims of others if a deaf ear is turned to its own legitimate claims?

The cars of a railroad are its own and do not belong to any other railroad. They are one of the chief means whereby it is able to care for its patrons. Industries should respect the ownership of equipment, and are not in any way justified in loading the cars of a railroad out over another line, no matter how badly the cars of the second road may be needed for shipments to points via that line or local to it.

The interests of railroads and industries are identical and they are both absolutely dependent upon each other. No policy, which is harmful to the one and favorable to the other, can be pursued through a term of years without becoming unfavorable to both. It is ultimately an advantage to an industry for railroad companies to carry on their business profitably in order that they may keep abreast of the times and afford such service as the rapidly increasing industrial development in this country demands. We have already seen the vast amount which the railroad companies of this country distribute each year in the form of purchases of material, wages and salaries. Are not the interests of so valuable a customer worthy of the consideration and protection of those who share so largely in its disbursements? On the other hand, if the railroad desires to see its business increase, and consequently its profits, it must for its part afford every opportunity for industries to market their products and expand their business. It requires no gigantic intellect to see that the interests of the railroad and industries are so interwoven that a blow at one is a blow at the other. We need, in this country, a keener realization of this principle and the promulgation of the doctrine: "Co-operation between transportation and industrial interests."

Galveston Causeway Plans.

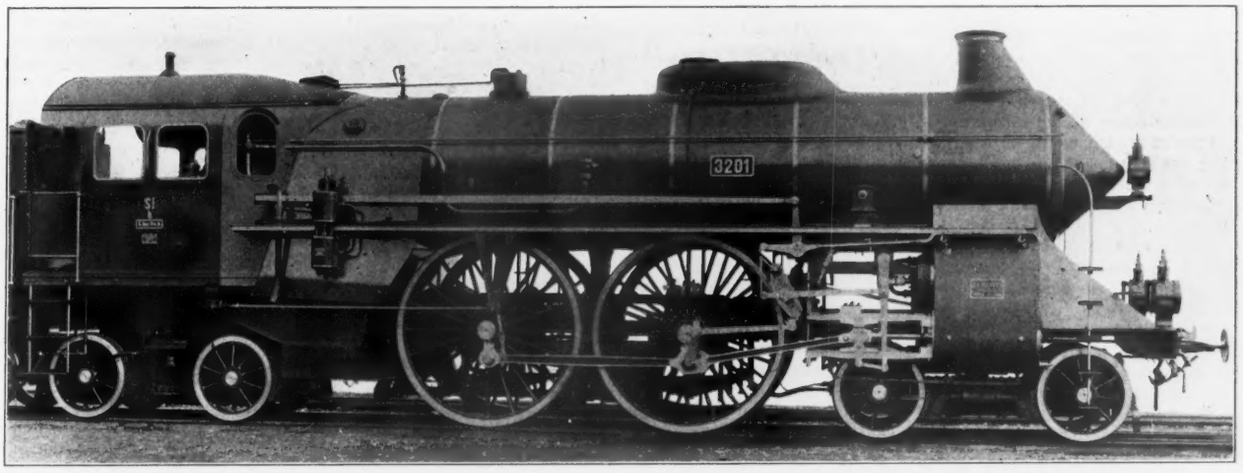
Plans and estimates for the proposed causeway across Galveston Bay, Texas, have been submitted to the Mayor of the city by James Stewart & Co., New York. Two plans are submitted, one for a structure to carry three steam railroad and two electric railway tracks, one roadway and one sidewalk, the estimated cost being $1,450,000. The other plan is the same, except that it provides for only two steam railroad tracks and one electric railway, at an estimated cost of $1,390,000. The larger causeway would be 140 ft. wide on top, 10 ft. above mean low water, and 10,850 ft. long, connecting the island of Galveston with the mainland at Virginia Point. The highway is to be 30 ft. wide, the footwalk 10 ft. wide, and a space of 10 ft. is allowed for water mains which are to supply the city of Galveston. On each side single rows of piles are driven 12 ft. apart on centers, with stringer sheet piling inside. Sand, gravel or clay, or a mixture of them, is to be used for the fill, and there will be rip-rap protection on each side laid with a slope of one and one-half to one. There will be three openings in the causeway. One, 100 ft. wide, will be spanned by three steel bascule bridges, one of which will carry two steam railroad

tracks, one an electric railway track, and the third for the roadway and footwalk. The other two openings will be 30 ft. wide, and across them will be built reinforced concrete arches. To provide for the tidal flow, 256 6-ft. reinforced concrete conduits will pierce the causeway 35 ft. apart on centers.

Four-Cylinder Compound Express Locomotive for the Bavarian State Railroads.

The Bavarian State Railways have in operation a 4-4-4 express passenger locomotive built by J. A. Maffei, of Munich, which embodies a number of interesting features. A first glance would indicate that the wind breaking plows at the front have been found to be a good thing in European practice, for we find them persistently recurring in new designs—somewhat simpler in general arrangement, to be sure, than the early elaborate forms that were used, showing that, in the opinion of the mechanical officers the device is worth using in the lower resistances offered to the engine by the air.

The frames are of the American bar type at the front, with a slab at the back over the rear truck, in which there is but little variation from the practice of this country. The wide firebox extending well out over the frames with the trucks set well to the rear lends itself to the use of the outside ashpan that is seen in



Four-Cylinder Compound Express Locomotive, with Schmidt Superheater, for the Bavarian State Railroads.

the illustration. A noticeable feature is the apparent lightness of the driving wheels, the very small counterbalance that is used, and the location of the same in the main wheels, where it is placed about 120 deg. back of the crank. The high and low-pressure cranks on the same side of the engine are opposite each other. The following are some of the principal dimensions:

Steam pressure	210 lbs.
High-pressure cylinder, diameter	16.14 in.
Low-pressure cylinder, diameter	24.0 "
Piston stroke	25.20 "
Driving wheels, diameter	86.61 "
Truck wheels, diameter	39.61 "
Heating surface, firebox	177.54 sq. ft.
" " tubes	2,141.24 "
" " superheater	403.50 "
" " total	2,722.28 "
Grate area	50.57 "
Weight in working order	184,800 lbs.
Tender capacity, water	6,864 gals.
Tender capacity, coal	15,400 lbs.
Total weight of tender, empty	41,800 "
Tractive effort	11,000 "

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 16.8$$

$$\frac{\text{Tractive effort x diam. of drivers}}{\text{Heating surface}} = 350.0$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 53.83$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 0.065$$

$$\frac{\text{Weight}}{\text{Total heating surface}} = 67.88$$

$$\text{Vol. of two H. P. cylinders, cu.ft.} = 5.95$$

$$\frac{\text{Total heating surface}}{\text{Vol. 2 H. P. cylinders}} = 456.75$$

$$\frac{\text{Grate area}}{\text{Vol. 2 H. P. cylinders}} = 8.48$$

Electrolysis of Underground Pipes.

BY PUTNAM A. BATES.

Although during the past 10 or 15 years a number of damage suits have resulted in the payment of large sums of money to certain water companies of this country and England to liquidate damages to their systems due to the mechanical weakening and consequent failure of hydrants, water mains, service pipes, etc., from electrolysis, it is noticeably true that only occasionally does one find that any precaution is taken by water companies to avoid a repetition of the experience of others in this direction. It might be argued that the water companies being in no way responsible for the damage done to their own property by electrolysis ought not to worry about any bad effects which might result at some future time, but a small amount of time spent in consideration of this problem before the piping system is laid out and installed might be all that would be necessary to prevent this needless damage and result in the saving of considerable money and much bitter feeling.

An examination of the conditions existing in water systems which have been installed for a considerable length of time, and which were put in without regard to the possibility of damage from this cause is likely to show most astonishing results, and if water companies located in the vicinity of electric lines could be brought to see the wisdom of making periodic tests for the presence of stray electric currents and act accordingly much damage to the water pipes could undoubtedly be prevented by taking the necessary steps to prevent the flow of these stray currents before a sufficient time for the destruction of the pipes had elapsed.

The chance of danger varies so with local and climatic conditions that it is almost impossible to lay down rules which would be proper for all installations. It is likewise true that conditions indicated from tests made at one season of the year do not necessarily hold good for others. Therefore to get a comprehensive idea of the situation in any one case it is necessary to study the problem from the standpoint of the particular installation in question, and to conduct tests under the extreme as well as the average conditions.

Electrolytic action will take place wherever a current of electricity leaves a conductor which is capable of being oxidized (such as cast-iron, wrought-iron or lead water pipes) and passes into some other conducting medium in the presence of more or less dampness, except in cases where the current passes directly from one metal conductor to another by direct metallic contact.

Thus it will be found that wherever a current of electricity leaves a line of water pipe and passes into the surrounding earth or water, either to follow some other path or to return to the pipe after passing some obstacle offering electrical resistance, such as an imperfect joint, more or less electrolytic action will be taking place, depending upon the volume of current leaving the pipe. This electrolytic action will result in corrosion and more or less rapid eating away of the pipe at the joint where the current is leaving, which will in time cause the pipe to fail.

A point which the railroad companies seem to loose sight of is the fact that their own property is being damaged as well as that of the water companies having pipes in the ground. Wherever the current leaves the rails, to pass through the earth into a piping system, due to a defective rail bond in the return circuit, electrolytic action will take place, and slowly but surely the rails at such places will be eaten away and will have to be replaced at considerable expense. A thorough bonding of the rails in the first place and a careful test of the return circuit from time to time would reduce this difficulty to a minimum.

The writer had occasion recently to make some exhaustive tests on a water system of one of the larger suburban towns lying just beyond the outskirts of New York city, the object of the investigation being to determine the conditions prevailing in that town with regard to the presence of leakage currents from the grounded circuit of the local traction company, operating an overhead trolley system with grounded return, and whether such currents, if they were found to exist, followed such a path and were of such volume as to cause damage to the pipes of the water company by electrolytic action.

The results of these tests made by the writer to determine the presence and direction of flow of leakage currents between the tracks of the trolley company and the gas mains, water mains, hydrants and service pipes showed the following conditions:

		Volts.
1.	Between gas main and trolley track	0.0 to 0.6
2.	Between water pipe for hydrant No. 36 and trolley track	1.5 to 6.0
3.	Between hydrant No. 31 and trolley track	1.6
4.	Between hydrant No. 31 and gas lamp post (lamp post positive)	0.9 to 1.0
5.	Between hydrant No. 31 and sewer manhole (hydrant negative)	1.1
6.	Between hydrant No. 24 and trolley rail	3.0 to 4.0
7.	Between hydrant No. 24 and gas lamp post (lamp post positive)	0.6
8.	Between hydrant No. 19 and trolley rail	3.5
9.	Between hydrant No. 10 and trolley rail	4.0 to 11
10.	Between hydrant No. 6 and end of trolley rail	4.5
11.	Between hydrant No. 3 and sewer pipe, where latter enters salt water bay inlet nearby	1.0
12.	Between hydrant No. 28 and trolley rails	2.5
13.	Between trolley rails and river running into above mentioned bay inlet.	2.5
14.	Between hydrant No. 30 and trolley rails	2.5 to 4.0

Voltmeter used for test was a Weston 0-15 volt instrument, having a resistance of 1,357 ohms.

Tests were made between the hours of 10 a.m. and 6 p.m. under ordinary conditions as found daily.

The actual difference of potentials at the time these tests were made were between the minimum of 0.3 volt (which was the smallest amount which could be read with certainty on the instrument) and a maximum of 11 volts depending upon the location of the point where readings were taken, amount of current taken by, and the position of the various trolley cars at the time when the tests were made.

These results indicate that a current of electricity of varying amount (depending upon the physical condition of the ground and the amount of current being used by the trolley cars at the moment) was leaving the trolley rails and finding its way into and along the pipes of the water company, traversing that path until it could find a point of low resistance at which to leave the water system, and go to earth to return again to the source from which it emanated.

Having determined these points, it still remained to ascertain as nearly as possible the volume of these leakage currents, as it is this alone which fixes the amount of damage which such stray currents are capable of causing. This was a much more difficult point to settle owing to the various electrical and physical conditions beyond our control.

In reading articles on electrolysis one very often sees statements made that if there is a difference of potential between any point on a pipe line and the surrounding earth, that point will be subject to electrolytic action, and the amount of the electrolytic action will be indicated by the difference of potential between that point and the surrounding earth. This is a fallacy and very often leads to erroneous results; for example, a test was made on a piece of "L" shape water pipe which supplied several houses located near the water front. The difference of potential between the corner of the "L" and the body of water was found to be 12 volts; the difference of potential between the body of water and a point on the extreme right of the "L" was found to be three volts. This would seem to indicate that a large amount of current was flowing from the corner of the "L" to the body of water and thence back to the generator. As a matter of fact, this particular point was free from electrolytic action, and the other point mentioned above having a difference of potential of three volts had considerable action taking place. The explanation of the above condition is found in the fact that nine volts were dropped in the horizontal portion of the "L." The corner of the "L" was on a hill composed of dry sandy loam, and the extreme right of the "L" was on lower ground, which was constantly damp. Thus it is seen that a high difference of potential between any point on a pipe line and the surrounding earth or water does not necessarily mean that much electrolytic action is taking place at that point. Reports and statements on electrolysis, as a general rule, refer only to difference of potential and make no mention of the current flowing, in spite of the fact that the work of electro-chemists all over the world has long ago established the fact that it is the volume of current flowing, and not the difference of potential between the electrodes which determines the amount of metal which will be eaten away from the anode or conductor, from which the current passes into the surrounding electrolyte. While the difference of potential is a fair indication of electrolytic action it must not be blindly relied upon in determining the extent of electrolytic action at any point.

In this particular test it was found possible to determine the amount of current flowing in a loop of pipe running from hydrant No. 41 to hydrant No. 2, and also on a loop feeding hydrants Nos. 40 and 9. In each of these loops a current was found of such volume as would be capable of causing rapid deterioration of the pipe if physical conditions were such as to cause that current to leave the pipe in a restricted area. If, however, as may be the case, this current should leave the pipe throughout a considerable area, it is probable that the damage done by electrolytic action would not be sufficient materially to affect the life of the pipe over that area.

On one occasion, between 11.30 and noon, when the load on the trolley system was at its minimum, a test was made to determine as nearly as possible the total amount of current entering the water system due to the leakage from the rails of the trolley road. With the exception of the time when the road was entirely shut down it was found that a current of very considerable magnitude was leaking from the trolley rails into the water mains. The current was of such volume, even at that time of the day, as to be capable of doing very considerable damage, and during the busy hours of morning and evening the current would naturally be even greater. Of course the mere presence of the current in a piece of pipe does not always mean that that particular piece of pipe must necessarily be subject to electrolytic deterioration. A great many joints in a pipe line might be so good electrically as to prevent the escape of enough current to cause the action. The current might manifest itself at one point, and no electrolysis might be taking place within several hundred feet of this point. If pipe lines could be laid so that the stray current would not leave them, except by a metallic connection with the negative side of the dynamo at the power house, electrolytic action could not occur. Unfortunately this is impracticable owing to the nature of the soil and the method of pipe line construction.

The flow of current in the above test was found to be continuous all during the time of test, although it showed the characteristic fluctuations of the trolley current caused by the variation in the power consumed by the trolley cars in operation at the moment. This current though very small in volume caused very much trouble, as it was compelled to leave the pipe in a restricted area. This condition might arise at any time, due to some portions of the pipe surface offering an easier exit for the current than others, or due to a leak in the pipe forming a small stream which might work its way through the soil, making a low resistance path for the electric current through the earth and causing the current to be concentrated at this point. This same condition might arise from subsurface streams crossing the pipe line, or at points where the pipe passes in a short distance from comparatively dry earth into damp or wet earth such as marsh lands. Again this condition might be brought about by a very bad joint in the pipe line, over which the current was flowing, offering more resistance to the passage of the current than the surrounding soil, which is a very common occurrence, in which case the current would leave the pipe at the joint to re-enter it further on.

One of the most interesting points brought out by the test referred to and the careful investigation which followed it was that wrought-iron and lead pipes forming the service connection to buildings taking water from city mains are more susceptible to electrolytic action than the cast-iron water mains themselves, and having so little body are rendered useless in a much shorter time than the large mains would be by the same current.

There is a physical reason for the lesser susceptibility of the cast-iron pipe to this electrolytic action, and it is to be found in the method of its manufacture and finish.

In casting these pipes the molten metal fuses the sand immediately surrounding them, and upon cooling this fused sand forms a silicious or glassy surface over the pipe. While this coat is extremely thin and is not uniform in its nature, it offers an appreciable resistance to the passage of electric current either into or out of the pipe, and this partial insulation of the pipe surface is often added to by a coating of asphaltic paint applied to the outer surface of the pipe. Wrought-iron and lead service pipes on the other hand have no such protecting coating, and as they are usually secured to the street mains by a screw joint or wiped joint, the electrical connection between the two pipes is excellent, and if one or more of these service pipes is located near some point where the current tends to leave the mains, it will be found that the current will use them as an exit and they will therefore be rendered unserviceable by electrolytic corrosion due to this current.

As a result of the tests and investigations herein referred to, it may be stated that the following facts were disclosed with respect to this particular system:

1. That a leakage of electric current from the rails of the trolley company does exist.

2. That the leakage current enters the pipes of the water company, and after passing along these as conductors leaves the pipes and passes into the surrounding earth, where low resistance is offered.

3. That this current is of sufficient volume to cause very appreciable damage to the pipes.

4. That this damage will be more apparent in the small service pipes than in the mains, partly because the amount of metal in them is so much less and partly because they form an easier exit for the current on account of their physical structure.

A conclusion which the writer has found to be frequently demonstrated and which is apt to be overlooked is that a water pipe system may seem to be practically everywhere positive to the trolley rails and yet be in a dangerous condition. The reason for this is simple enough if one gives it a little thought, yet tests have been reported as showing a safe condition when the current was actually leaving the pipe at a point which could not well be tested from the surface, and would re-enter further on, making the next hydrant or exposed joint indicate a positive relation to the trolley system. Much time and money have also been spent for tests which have resulted in reports being rendered that a safe condition existed, when serious damage was actually taking place, owing to the fact that the tests showed a leakage current of an extremely low potential, no effort being made to determine its volume.

In outlining the above tests I have dwelled considerably on the cause and effect of stray current from trolley systems, and before concluding wish to say a few words regarding the various methods of preventing and guarding against this destructive foe.

After a grounded return trolley system has once been installed in the neighborhood of a piping system there is nothing that a water company can do to absolutely protect their pipes from electrolytic action. There are many ways, however, in which they can reduce the trouble to a minimum. As an example, it was found in the above test that a large number of lead service pipes were so badly corroded that they became absolutely useless. This was brought about by the fact that the current in leaving the piping system at certain points left by way of these lead pipes and passed through the earth for a distance of about 50 ft., and then entered another main. If a jumper of sufficient cross section had been connected between these two mains, which were about 50 ft. apart, the current would not have left by way of the lead pipes and the latter could have been saved.

Several remedies can be applied to parts of an affected piping system which will in most cases result in saving such affected districts. It rests entirely with the trolley companies to decide whether their systems shall or shall not cause electrolysis of underground pipes. If they so choose, they can entirely prevent the nuisance. They have but two questions to consider, viz., shall we put in an expensive return system and be sure no pipes are being damaged, or shall we save considerably on our first cost by using a track return and run the chances of paying damages to the water company for destroying their pipes? Unfortunately they usually choose the latter.

When the return circuit is grounded it is impossible to entirely prevent the escape of current from the return system, but the amount of leakage current can be greatly reduced by thoroughly bonding or welding the joints in the track. In time, however, due to wear and atmospheric conditions, some of these joints might become defective and leakage result. A very good way to detect defective bonds, after a system is in operation, is to make a trip over the road after a slight snowfall and take a look at the various rail joints. Defective bonds will manifest themselves by melting the snow about them due to the heat caused by the high resistance of the joint. This, however, will only point out bonds which are in very bad condition.

If it were possible to maintain a balanced condition, a three-wire system might be used in which the ground could act as a neutral and the two trolley wires as the outside conductors. This, however, is rarely done, as it is next to impossible to keep the two sides of the system balanced, and any unbalancing would cause current to flow through the earth and the surrounding pipe lines. A good feature of the three-wire system, however, is the fact that the stray current which would flow through the ground would not always flow in the same direction. When one side of the system became unbalanced the ground acting as the neutral would carry the current in one direction, and when the other side of the system became unbalanced the current in the ground would flow in the opposite direction so that while any water pipes which might pick up the current would be eaten away at one time, they would have metal deposited on them when the current flowed in the opposite direction.

Another method which might be used is to apply an extra generator at the power house, the negative side of which is connected with the piping system and the positive side to the feeder system. If this generator is kept at a slightly higher potential than the rest of the system all underground pipes to which it is connected will become electro-negative and electrolysis will be prevented to some extent. This system, however, has many disadvantages and is rarely if ever employed to mitigate the nuisance.

If the danger zone has been definitely located on any piping system, a large conductor can be run from the negative side of the generator and be connected to all the pipes of the underground system in the affected territory. This might happen to be a good many miles from the power station, and for that reason becomes impracticable in many instances.

There are a few other methods which slightly improve conditions, but there is only one satisfactory way out of the difficulty, and that is to install a complete metallic circuit for the traction system. This is usually accomplished by employing what is known as the double trolley system in which arrangement the current passes from one trolley to the motor, through the motor, and out through the other trolley to the second trolley wire and thence back to the negative side of the generator, both wires being insulated from the ground. This system has been employed in several of the western cities.

When the open conduit system is used, as is the case in our larger cities, the circuit is completed through two conductors lying side by side in the conduit and both being insulated from the conduit. With these two arrangements there is little inducement for a current to be diverted from the conductors and to stray off on iron pipes or underground metallic structures, taking some other course back to the negative side of the dynamo.

While these two methods of overcoming electrolytic action add somewhat to the first cost of the electrical equipment of a railroad system, the results obtained are well worth the additional outlay.

Train Accidents in the United States in July.[1]

bc, 2d, Mobile, Jackson & Kansas City, Newton, Miss., butting collision of freight trains, wrecking both engines and several cars. Both firemen were killed and three other trainmen were injured.

dn, 3d, Delaware & Hudson, Ballston, N. Y., a passenger train was derailed at a misplaced switch and the engine and four parlor cars were overturned and ditched. The occupants of the train all escaped uninjured.

bc, 4th, 11 p. m., Northern Pacific, South Tacoma, Wash., collision between a passenger train and an empty engine; both enginemen injured.

unx, 4th, Salt Lake & Ogden, Farmington, Utah, the tender of the locomotive of a passenger train was derailed and, with the first two cars, was wrecked. The engineman and fireman were injured, the engineman fatally.

unx, 4th, Central of New Jersey, Bethlehem, Pa., a passenger train was derailed at a switch and the engine and one car were overturned. Two passengers were injured.

†rc, 5th, 2 a.m., Chicago, Rock Island & Pacific, Maple Hill, Kan., a fast freight train, carrying fruit, ran into the rear of a preceding stock train, wrecking the caboose and several cars. Two drovers riding in the caboose were killed, and two others were injured.

unx, 5th, Lake Shore & Michigan Southern, Glenville, Ohio, a fast mail train consisting of two mail and seven passenger cars was derailed. A man stealing a ride was fatally injured.

unx, 6th, Kansas City Southern, Ravanna, Ark., a work train was derailed and the engine and seven cars were ditched. Three trainmen were injured, one of them fatally.

unf, 7th, Little Rock & Hot Springs Western, Gulpha, Ark., the engine of a passenger train was derailed at a burning trestle and, with the baggage car, fell to the creek below. One passenger car fell part way through but remained suspended a few minutes, and the passengers escaped without serious injury. About 25 passengers were injured, but only two of them seriously.

bc, 8th, 2 a. m., Western & Atlantic, Chattanooga, Tenn., butting collision of freight trains, making a bad wreck, which took fire and was partly burned up. Both enginemen and both firemen were killed. It is said that the southbound train ran past a meeting point.

bc, 9th, Chicago, St. Paul, Minneapolis & Omaha, Stillwater, Minn., butting collision between a passenger train and a switching freight train, damaging both engines and several freight cars. Four trainmen and one passenger were injured.

xc, 9th, Southern Railway, Memphis, Tenn., collision between a passenger train and a switching freight train, doing slight damage. Immediately after the collision the switching train ran unattended some distance to Calhoun street and collided with two mail cars. Nine persons were injured, one of them seriously.

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defects of roadway.
eq	Derailments; defects of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

unx, 9th, Atchison, Topeka & Santa Fe, Flagstaff, Ariz., passenger train No. 4 was derailed and the engine was ditched. The engineman and fireman were badly scalded, the fireman fatally.

unf, 9th, Surry, Sussex & Southampton, Wakefield, Va., a freight train was derailed at a washout and the fireman was killed.

*rc, 10th, Seaboard Air Line, Lake City, Fla., a freight train standing in the yard was run into at the rear by a following freight, and the engine, caboose and several cars were wrecked. The wreck took fire, but by the aid of the city fire engines the flames were soon extinguished. A brakeman was killed and the engineman and fireman were injured.

bc, 10th, Little Rock & Hot Springs Western, Hot Springs, Ark., butting collision between passenger train No. 6 and an empty engine. Three trainmen and several passengers were injured.

xc, 10th, 3 a. m., Anderson, Ind., a passenger train of the Cleveland, Cincinnati, Chicago & St. Louis collided with a freight train of the Central Indiana, at the crossing of the two roads, and the passenger engineman was badly injured.

rc, 11th, Seaboard Air Line, Columbia, S. C., a freight train consisting of several freight cars, two empty passenger cars and a caboose, standing at the station, was run into at the rear by a following freight and the caboose and the passenger cars were derailed and knocked off a bridge. Two trainmen in the passenger cars were injured, one of them fatally.

xc, 12th, 4 a. m., Pennsylvania Railroad, Atglen, Pa., an eastbound passenger train collided with a freight, badly damaging both engines and wrecking one baggage car. Five trainmen were injured, one of them fatally.

dr, 12th, St. Louis, Iron Mountain & Southern, Chidester, Ark., a passenger train was derailed by spread rails and 24 passengers were injured, only two of them seriously.

unf, 4 a. m., Southern Railway, Petersburgh, Ind., a freight train was derailed at a switch which had been maliciously misplaced or blocked, and the engine and several cars were wrecked. Two trainmen were killed and two injured.

unx, 12th, Minneapolis, St. Paul & Sault Ste. Marie, Kenmare, N. Dak., a work train was derailed and the engine and seven cars were ditched. Seven employees were injured, two probably fatally.

unx, 13th, Chicago, Indianapolis & Louisville, Rose Lawn, Ind., the engine and first two cars of a passenger train were derailed and the engine and express car were overturned; six persons were injured.

rc, 14th, Northern Pacific, Sandpoint, Idaho, eastbound passenger train No. 4 ran into the rear of a work train standing on a side track, wrecking the caboose and five cars of the train on the siding. The engineman of the passenger train was fatally injured.

xc, 14th, 1 a. m., New York Central & Hudson River, Buffalo, N. Y., a train consisting of an engine and a caboose, the engine running backward and pushing the caboose, collided with some freight cars, making a bad wreck. One trainman was killed and three were injured.

unx, 14th, Chesapeake & Ohio, Buchanan, Ky., a work train drawn by two engines was derailed, and both engines were ditched. One man was killed and three were injured.

rc, 15th, Grand Trunk, Holly, Mich., a freight train which had been stopped at the crossing of the Pere Marquette was run into at the rear by a following freight, drawn by two engines, and one man was fatally injured.

xc, 15th, Erie road, Port Jervis, N. Y., a passenger train ran over a misplaced switch and into a locomotive standing on a side track, pushing the locomotive along some distance into another engine, which was overturned. One engineman was killed and two other trainmen were injured. It is said that the switch was maliciously misplaced.

dr, 15th, Great Northern, Chiwaukum, Wash., an eastbound passenger train was derailed at a point where the track had been distorted by the heat of the sun, and the engine and first three cars were overturned.

bc, 16th, Gulf, Colorado & Santa Fe, Plantersville, Tex., butting collision of freight trains, making a bad wreck. The northbound train is said to have disregarded a meeting order. One engineman and one fireman were killed and three other trainmen were injured, one of them fatally.

dr, 16th, Philadelphia & Reading, Philadelphia, Pa., a passenger train was derailed at a defective switch and two passenger cars were badly damaged by running against coal cars on a side track. Two passengers and two trainmen were injured.

unx, 16th, Southern Railway, Maben, Miss., a freight train was derailed and the engine and several cars were wrecked. Two trainmen were injured, one of them fatally.

unx, 16th, Central of Georgia, Marshallville, Ga., a freight train consisting of a locomotive and two cars, was derailed while running at high speed, and the whole train was ditched. The engineman, fireman and one brakeman were killed.

dr, 18th, Colorado & Southern, Forbes Junction, Col., a passenger train was derailed and several cars were ditched. The engineman was killed and the fireman injured.

unx, 18th, 11 p. m., Louisville & Nashville, Pilot Knob, Tenn., freight train No. 74 was derailed and seven cars were wrecked; one man was killed.

unx, 20th, 8.30 p. m., Southern, Salisbury, N. C., a freight train running at high speed was derailed at a point where the track was not in good condition, and the engine and six cars fell down a bank. The fireman was killed and two other trainmen were injured.

dn, 21st, Wheeling & Lake Erie, Warrenton, Ohio, a passenger train was derailed while running fast over track not suitable for high speed. The engine was overturned and one passenger car was badly damaged. The engineman was fatally injured and one passenger was injured.

unx, 21st, St. Louis & San Francisco, Guin, Ala., a freight train was derailed and the engine was overturned. One brakeman was killed and the fireman was injured.

bc, 22d, Central of Georgia, Fort Valley, Ga., butting collision of freight trains, wrecking both engines and 11 cars. Two brakemen were killed and two other trainmen were injured. It is said that the eastbound train disregarded a meeting order.

†bc, 22d, 9 p.m., Seaboard Air Line, Hamlet, N. C., butting collision between eastbound passenger train No. 44 and a westbound freight train, making a bad wreck. Twelve passengers and four trainmen were killed and 29 passengers and two employees were injured. The collision was due to failure of operator at Rockingham to deliver a despatcher's order to the passenger train. The order was put out at Rockingham, the meeting point, by the despatcher in violation of rules.

†unx, 22d, Great Northern, Maneta, Wash., the rear car of a passenger train was derailed near a trestle bridge, and after running some distance on the bridge was overturned and fell to the canyon, 50 feet below. Four passengers were killed and seven were injured.

unf, 23d, Kansas City Southern, Shreveport, La., a freight train was derailed by running over some cattle, and the engine was overturned. The engineman was killed and the fireman was injured.

unx, 23d, Great Northern, Camden, Wash., an eastbound passenger train was derailed while running at high speed over a curve and the engine and first three cars fell down a bank. The engine was submerged in deep water. The engineman, fireman, mail clerk and express messenger were killed, and three passengers were injured.

24th, 11 p.m., Northern Pacific, Hobart, N. Dak., a freight train was derailed at a switch and eight cars were wrecked. Two employees were killed and four injured.

bc, 25th, 10 p. m., Nashville, Chattanooga & St. Louis, Cartersville, Ga., butting collision of freight trains, wrecking both engines and 12 cars. Four trainmen were injured.

dr, 26th, Erie road, Jersey City, N. J., a freight train was derailed and the engine was overturned; engineman, fireman and one brakeman killed. The derailment is said to have been due to poorly ballasted track.

26th, St. Louis & San Francisco, Springfield, Mo., a passenger train was derailed at a switch and one passenger car was overturned. Twenty-five passengers were injured, two probably fatally.

unx, 26th, St. Louis, Iron Mountain & Southern, Ironton, Mo., a passenger train drawn by two engines was derailed at a curve, and both engines and three cars were ditched. One engineman was killed and three other trainmen were injured.

rc, 27th, Louisville & Nashville, Clanton, Ala., a freight train standing at a water tank was run into at the rear by a following passenger train, making a bad wreck. The fireman was killed.

xc, 28th, 4 a. m., Southern Railway, Spencer, N. C., collision of freight trains; one brakeman killed, two other trainmen injured.

bc, 29th, Cleveland, Cincinnati, Chicago & St. Louis, Rushville, Ind., butting collision between a freight train and a work train, due, it is said, to misunderstanding of orders. One employee was killed and several others were injured.

unf, 29th, St. Louis & San Francisco, Antlers, Ind. T., a passenger train was derailed by a spike which had been fastened on the track and the engine and one car fell down a bank. The fireman was killed and three other trainmen were injured.

unf, 29th, 11 p. m., New York Central & Hudson River, New Hamburg, N. Y., a northbound passenger train was derailed by a landslide and the first two cars were wrecked. The engine fell down the bank and lodged partly in the waters of the Hudson River. The engineman and fireman were killed and 12 passengers were injured.

bc, 30th, Pittsburg, Cincinnati, Chicago & St. Louis, Columbus, Ind., butting collision of passenger trains; six passengers injured.

rc, 31st, 1 a. m., New York Central & Hudson River, Newark, N. Y., rear collision of freight trains wrecking one engine and 15 cars. The foremost train had been unexpectedly stopped by the breaking of a coupling in the middle of the train. One engineman was killed.

dr, 31st, Atchison, Topeka & Santa Fe, Shawnee, Okla., a freight train was derailed by spreading of rails and nine cars were wrecked. A brakeman was killed and one brakeman and an unknown man were injured.

GENERAL NEWS SECTION

NOTES.

Sir William Van Horne, chairman of the Board of Directors of the Canadian Pacific, is quoted as having said in an interview at New York that two miles of line in the interest of the Canadian Pacific will be built in Great Northern territory to every mile that Mr. Hill builds in the Canadian Pacific's territory.

At Jamestown, N. Y., August 24, the Federal Grand Jury brought in further indictments against the Standard Oil Company for securing unlawful freight rates; and the New York Central & Hudson River Railroad was indicted on similar charges. In the indictment against the Standard Oil Company there were 123 counts.

A press despatch from Pittsburg says that the Pennsylvania Lines will revise interstate passenger fares to and from points in the state of Ohio, so as to make them conform to the 2-cents-a-mile basis which governs rates for journeys wholly within that state. For example, the fare from Pittsburg to Cleveland will be calculated at 2 cents a mile for the portion of the distance that is in Ohio, and at the present (higher) rate in Pennsylvania.

According to the *Journal of Commerce*, New York, the Union Pacific, acting on the assumption that the revised Interstate Commerce law will require the road to provide itself with refrigerator cars, has invited bids for 6,000 refrigerator car bodies. It is understood that this means the termination, at the earliest practicable date, of the contract between the Union and Southern Pacific lines and the Armour Car Lines.

The New York Central has for the past three or four weeks been using an electric locomotive and a motor car on a short stretch of track between Kingsbridge and Morris Heights to give steam locomotive enginemen experience in running electrical equipment. Instruction is given between 9 a.m. and 5 p.m. on three days of the week by an engineman who spent a year and a half at Schenectady while the plans for the electric equipment were being worked out. It is expected that at least 80 men will be needed at the beginning of electric operation of trains.

The trunk line railroads terminating in New York have asked the Flour Committee of the New York Produce Exchange to meet them with a view to reducing the free time allowed for the storage of flour. At present, domestic shipments are stored free 20 days and export shipments 60 days, and flour held in cars is charged for at the rate of $4 a car for 10 days. The railroads propose to reduce free time in store houses to 10 days and to raise the rate for car storage to $1 a day. The stiffening of the Interstate Commerce law has evidently made the glaring inequality of the present rates apparent even to the hardened traffic men.

The Interstate Commerce Commission, in an opinion by Commissioner Clements, has announced its decision in the case of the Farrar Lumber Co. against the Southern Railway Co. and other carriers. The rate on pine lumber from Southern Georgia points to Chattanooga, Tenn., is two cents per 100 lbs. higher than to Dalton, Ga., but on shipments to Cincinnati, Chattanooga takes a rate two cents lower than Dalton. There is also a dressing-in-transit privilege at Dalton, for which two cents per 100 lbs. additional is charged. The lumber shipped out of Chattanooga is mostly hard wood, the Southern pine lumber brought to that point being practically consumed there. The Commission holds upon complaint against the rate from Dalton that under all the circumstances the lumber rate from Dalton to Cincinnati is not so discriminative nor exorbitant as to justify disturbance at this time, and that the reasons existing for the lower lumber rates from the Southern pineries do not apply to the reshipment of dressed lumber from Dalton. Cleveland and Charleston, Tenn., take the Chattanooga rate on lumber to Cincinnati, but the conditions at those points are not the same as at Dalton, and it is held that no wrongful discrimination results from the existing adjustment of rates.

Kansas City Southern Shops at Pittsburg, Kan.

Work has been begun on the enlargement of the Pittsburg (Kansas) shops of the Kansas City Southern. These are the principal repair shops of the road, and are at a district terminal, which, of course, necessitates facilities for the handling of road engines. The proposed improvements include the following:

A 16-stall machine and erecting shop, 356 x 152 ft., consisting of a steel frame with brick curtain walls. A 15-stall 90-ft. roundhouse, designed for future extension to 33 stalls. This building will have brick walls and wood posts and roof construction, and will be served by a new 80-ft. turntable. A new coaling station. Plans for this have not been adopted, but the lay-out will probably consist of a locomotive crane and the necessary accessories. A sand house made of wood, resting on concrete foundation. A concrete oil house. A 100,000-gallon elevated metal water tank to feed engines through two 10-in. water cranes and to be supplied from a 250,000-gallon concrete reservoir, to which the water will be raised by compressed air from two 8-in. deep wells which were drilled several years ago. A four engine cinder pit. An electrically operated 46-ft. transfer table to serve erecting shop. This will be overlapped by an electric traveling yard crane of 30 tons capacity, giving connection between the new erecting shop and the present machine shop, and extending over a platform to be built at one end of the present storehouse.

The present roundhouse, coal chute, sand house and water tank are out of date and of insufficient capacity, and it will be abandoned as will also a light transfer table which serves a building 288 x 120 ft. used as a machine, boiler and blacksmith shop for locomotive repairs. This building will be rearranged on the inside and used for boiler and tank work and carwheel machinery. The present car shed and planing mill, 203 x 117 ft.; coach and paint shop, 144 x 107 ft., and storehouse, 173 x 55 ft., will be retained for present purposes. The Arnold Company, Chicago, has been awarded the contract for the designing and construction of the above improvements and the installation of modern power and shop equipment, which will practically double the capacity of the present plant.

Canadian Railroad Subsidies.

An order-in-council adopted by the Canadian government provides that hereafter railroads will only be paid subsidies on the cost of road construction, without including the cost of rolling stock equipment, which has sometimes been done in the past so as materially to increase the subsidy.

The Interstate Commerce Law.

The Act to Regulate Commerce, as amended by the Hepburn law of June, 1906, and by other (earlier) laws, has now been issued by the Interstate Commerce Commission in revised form and it is printed in a pamphlet of 59 pages. The pamphlet includes also the acts supplementary to the Interstate Commerce law; the safety appliance acts; the railroad accident law, and the arbitration law of June 1, 1898. A press despatch from Washington says that the 50,000 copies of this pamphlet, which were prepared by the Commission, proved insufficient to meet the demand, from railroads and others, and that an outside publisher in Washington has issued copies of the Commission's publication.

Revised Interstate Commerce Law in Effect.

The Interstate Commerce law, as revised by the Hepburn law of June, 1906, went into effect on Tuesday of this week, with the exception of the section forbidding railroads to be interested, as owners, in property which they transport. At Washington, on Tuesday, about fifty railroad traffic officers gathered at the office of the Interstate Commerce Commission, and the Commission held an informal hearing, though Commissioners Prouty and Harlan were absent. The railroad representatives made numerous requests for interpretations by the Commission of new clauses in the law, particularly that relating to 30 days' notice of changes in rates, and that requiring the posting of tariffs. The railroads hope that a placard saying that the tariffs can be seen by applying to the agent will be deemed sufficient. The roads also ask for an extension of time, perhaps several months, in which to prepare new tariffs. Vice-President Grammer, of the New York Central Lines, said that the railroads ought to be able to comply with the new law as regards export rates—which means it will be practicable to abandon the very frequent changes in export rates which have heretofore been common, especially in the cotton traffic. All the requests were denied, the Commission deciding that it was for the roads to conform to the law according to their own best lights. Complaints of non-compliance will have to be taken before the Commission in the usual manner.

After the railroad men had been heard, F. T. Bentley, of Chicago, a representative of the Illinois Manufacturers' Association and the American Shippers' Association, presented a series of resolutions, an abstract of which follows:

That we favor a continuance of the present practice of having tariffs in the custody of agents, with a placard announcing that they are open to public inspection.

That only one amendment to a tariff shall be in effect at one time, and when a later amendment is necessary it shall include all live changes up to date.

As to the thirty-day requirement of publication of tariffs: That we favor the Commission ruling that a reduction in domestic rates can be made effective on ten days' notice and on export business allow three days' legal notice for any reduction on the same.

That we favor a Commission ruling that a line having no published tariff rate or carrying a higher published tariff rate than

its competitors publication should be permitted to accept and forward business upon telegraphing the Commission the facts and stating that they adopt the competitors' rate as their own; to become effective at once, and to prevent discrimination it must accept the lower competitive rate.

That we favor the railways adopting a switching tariff at each competitive point.

That means be devised to make a railway company quote rates to the public and be responsible therefor, even though they make an error in so quoting.

That we favor a ruling from the Commission that an application sheet showing such territory or such railroad connections as are parties to the rate from a particular terminal should be considered legal and sufficient.

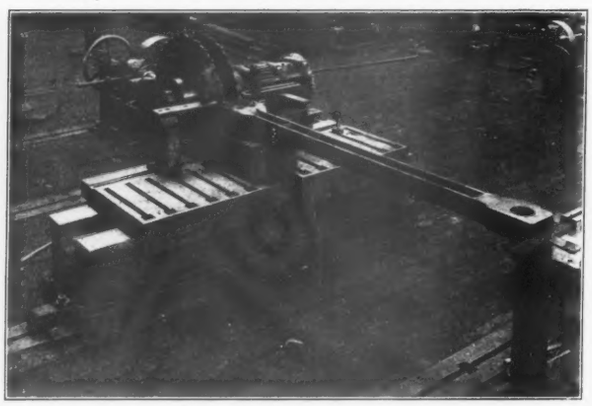
That we should insist that the railway companies recognize the sum of locals as the only legal rate when such sum is lower than a higher published through rate.

That the practice of making import rates on commodities competitive with domestic productions is discriminatory and that the lowest basis from any foreign port to an inland destination should not be lower than the domestic rate from the most favorably located port of entry, and in no case should through import rates be less than the export rates in the opposite direction between the same points.

That we favor the adoption by all shippers of a freight receipt or bill of lading without any conditions as are now embodied in bills of lading in use generally.

A New Cold Saw Cutting Off Machine.

The accompanying illustration shows a No. 3 crank shaft cold saw cutting off machine made by the Newton Machine Tool Works, Philadelphia, Pa. The machine as illustrated is set up on the testing floor and carries two Taylor-Newbold inserted tooth saw blades, 36 in. in diameter, set at 5½ in. apart. The locomotive connecting rod which is being slotted is 5 in. thick, and was slotted from the end to the two holes shown, which are 12 in. from the end of the rod, in 14 minutes. The spindle of this machine is



driven by spur gearing through a phosphor bronze worm wheel and a hardened steel worm of steep lead. It is also fitted with automatic feed and power quick return to the carriage. The work tables are adjustable independently. The machine is adapted to all classes of cutting off and slotting, including cranks for center crank engines, locomotive connecting rod straps and side rods, guide yokes and similar work. By using a special fixture, rods up to 5 in. wide can be cut to a depth of 22 in. With the machine as illustrated spacing collars are furnished to give a maximum distance between the saw blades of 10 in.

Quick Work in the Signal Department.

A Taylor all-electric interlocking machine at Easton, Pa., which was completely "knocked out" recently by a derailment which destroyed the tower, was reconnected and again put in operation within four hours after the tracks were cleared so that they could be used. This information, illustrating one of the advantages of a power plant in such an emergency, is furnished by an officer of the Lehigh Valley, the road to which the machine belongs. The derailment was on the track of another road adjacent, and a mechanical (manual) plant which was damaged by the same accident was out of commission three days. It is proper to say that although the tower containing the electric machine was completely destroyed, the machine itself was not much injured, and the main thing that had to be done besides restoring the electrical connections was to fix up a frame for the machine. Power was temporarily secured from the plant at Phillipsburg, on the opposite side of the Delaware river.

In this connection we are reminded that in two important yards—that of the Boston & Maine, at Boston, and that of the Grand Central Station, New York—new machines were recently connected and put in use within 25 minutes from the discontinuance of operations with the old machine. At Boston the change was made from an old to a new electro-pneumatic machine; and at New York from an all-air to an all-electric. At this cabin, which is at 56th street, about half a mile from the terminus, the new machine has 88 levers, while the old one had only 32.

Wallwork's Electric Lamp Brackets.

The accompanying illustration shows a Wallwork's electric lamp bracket made by the Wells Light Mfg. Co., New York. This bracket is fitted, as shown, with universal ball and socket and elbow joints and is especially adapted for use where a light is needed in a definite position, such as in offices, work shops, shipping rooms, etc. They are made of black enameled iron and are furnished with Hubbell standard Edison chain pull sockets wired-up and ready to connect to the electric wires. The special feature claimed for these brackets is the ease with which the light can be shifted to and held in any desired position.

The Wallwork Electric Lamp Bracket.

TRADE CATALOGUES.

Corrugated Steel Bars.—A corrugated bar pamphlet is being distributed by the Expanded Metal & Corrugated Bar Co., St. Louis, Mo. The introduction discusses the elastic limit of concrete and the function of the embedded metal, the mechanical bond between the two, and points out the advantages of the corrugated bar for this use. Illustrations of old and new style and universal type corrugated bars are shown, as are also fac-simile letters from the Building Bureaus of New York and Philadelphia, respectively, approving for general use in these cities the fireproof floor construction of this company. Half-tone and line illustrations of floor slab designs follow.

Preservative Coatings for Iron and Steel.—The Joseph Dixon Crucible Co., Jersey City, New Jersey, has just issued a pamphlet in which is given illustrations and reports of the conditions of the steel frames of the buildings in San Francisco, after the fire, which were painted with Dixon's silica graphite paint. All of the reports show that this paint had perfectly preserved the maximum strength of the steel work. The first page in the pamphlet contains an interesting diagram which shows the comparative area and the dates of America's great fires.

Car Heating and Electric Switches.—Two new pamphlets are being distributed by the Consolidated Car Heating Company, New York. One illustrates and describes electric switches for electric bolsters, car lights, headlights and switchboards, and the other is devoted to describing various electric heaters for cars and for house and office use. Illustrations of the heaters are given as well as diagrams which show the method of wiring.

Steam Specialties.—Two catalogues sent by The John Davis Co., Chicago, describe "Eclipse" steam specialties and separators respectively. The former is a 38-page book covering steam traps, water columns, back-pressure valves, blow-off valves, reducing and regulating valves, pump governors, low water indicators, etc. The separator pamphlet illustrates in detail and gives data regarding the various patterns of steam separators.

Rock and Ore Breakers.—Bulletin No. 1,416, issued by Allis-Chalmers Co., Milwaukee, Wis., contains illustrations and a detailed description of its latest design of Gates rock and ore breaking machine, which is known as style "K" breaker. This is an entirely new machine and is adapted to reduce all kinds of rock under all conditions.

Flexible Staybolts.—Illustrations of a few installations of the Tate flexible staybolt and an extract of a paper on "Locomotive

Water Space Stays," read before the Pittsburg Railway Club by B. E. Stafford, are given in a small pamphlet issued by the Flannery Bolt Co., Pittsburg, Pa.

Manufacturing and Business.

The Pioneer Cast Steel Truck Co., Postal Telegraph Building, Chicago, has been incorporated to manufacture and market boltless cast steel trucks under patents of W. E. Symons. The officers are: W. E. Symons, president; Frank W. Furry, vice-president; E. M. Hadley, secretary and treasurer. The truck design was described in the *Railroad Gazette* of July 27.

Iron and Steel.

The American Bridge Co. has a contract for supplying and erecting 600 tons of structural material for a cement plant in Center Furnace, Ohio, also for 780 tons of steel for bridges on the Portland & Seattle, and an additional tract for 500 tons for a cement plant at Homestead, Pa., for the Carnegie Steel Co.

Several orders for standard rails have recently been let by big steam and electric traction roads for delivery this year and throughout the first half of next year. The Ione & Eastern has bought from the Pennsylvania Steel Co. 11,150 tons, and the Northern Pacific has given a suplementary order to the United States Steel Corporation for 10,000 tons for 1907 delivery. The Brooklyn Rapid Transit Co. has bought 1,324 tons of special chemical contact rails for 1906 and 1907 delivery. In addition miscellaneous trolley lines have bought 5,000 tons of standard rails for 1907 delivery.

Many of the railroads are preparing contracts for bridges, terminal stations and elevated track work for next year. The Pennsylvania Steel Co. has the contracts for 11 of the 15 new bridges for the New York Central; the orders for the remaining four bridges have been let to the American Bridge Co. The Pennsylvania Steel Co. also has the contract for a Scherzer bridge to be built over the Bronx river for the New York, New Haven & Hartford. This company has also ordered another Scherzer bridge to be constructed over the Harlem river. The contract for the municipal bridge at Pelham Park has been let by Commissioner Stevenson to the Williams Engineering Co. The Columbus & Erie, a subsidiary of the Erie, is negotiating for two new bridges to be built near Columbus, Ohio.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

International Railroad Master Blacksmiths' Association.

At the annual meeting of this association in Chicago, August 21, the following officers were elected for the next year: President, J. S. Sullivan (Penna.), Columbus, Ohio; first vice-president, G. H. Judy (B. & O.), Glenwood, Pa.; second vice-president, J. W. Russell, Renova, Pa.; secretary and treasurer, A. L. Woolworth (C., H. & D.), Lima, Ohio; chemist, G. H. Williams, Boston, Mass. The next convention is to be held in Montreal in 1907.

The Railway Signal Association.

At the next meeting of this Association to be held at the Great Northern Hotel, Chicago, Sept. 11, "Standard Specifications for Mechanical Interlocking" will be discussed and certain revisions recommended for consideration at the annual meeting, also "Identification Marks for Wires and Cables from a Maintenance Point." The Secretary announces that on account of the presence in Washington, D. C., of two other large conventions on October 9th, 10th and 11th, and a scarcity of room to hold sessions and facilities to display exhibits, the Executive Committee left it to a vote of the active members to select a new date; and the date is now fixed by this vote as October 16, 17 and 18. The New Willard Hotel will be Association headquarters.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Delaware & Hudson.—See Quebec, Montreal & Southern.

Grand Trunk Pacific.—Alfred Brunet, of Montreal, has been appointed by the Provincial Government of Ottawa as its representative on the Board of Directors of the Grand Trunk Pacific.

Interstate Commerce Commission.—The President has nominated James S. Harlan, of Chicago, formerly Attorney-General for Porto Rico, as a member of the Interstate Commerce Commission, making the Board complete as provided by the Hepburn bill.

Quebec, Montreal & Southern.—The officers of this company, which is the holding company for the Delaware & Hudson's sibsidiaries in Canada, are as follows: David Wilcox, President; A. T. Culver, Vice-President, and Senator Beique, David Wilcox and A. T. Culver, Executive Committee, Senator Beique representing the Canadian interests. These officers, together with R. Leimeux and G. F. Hart, constitute the Board of Directors.

Wabash.—S. J. Parks has been appointed Auditor of Passenger Accounts, succeeding G. G. Landers, deceased.

Operating Officers.

Alabama Great Southern.—See Cincinnati, New Orleans & Texas Pacific.

Atlantic Coast Line.—E. H. Henneger has been appointed Superintendent at Wilmington, N. C., succeeding J. A. Fountain, assigned to other duties.

Canadian Pacific.—F. M. Spaidal, Superintendent of Terminals at Montreal and of the line from that place to Smiths Falls, has resigned to go to the Canadian Northern. J. Vaughan, Assistant Superintendent, succeeds Mr. Spaidal, with office at Montreal, Que. R. W. McCormick, Trainmaster at Ottawa, Ont., succeeds Mr. Vaughan, with office at Smiths Falls, Ont.

Central of Georgia.—A new division to be called the Chattanooga division has been formed, and R. J. Armstrong, Trainmaster at Cedartown, Ga., has been appointed Superintendent of it, with office at Cedartown. It consists of the lines from Giffin to Chattanooga, Chickamauga to Durham, and Lyerly to Toles Hollow. Other divisions have been rearranged as follows: Macon division, consisting of lines from Macon to Atlanta, Barnesville to Thomaston, S. M. & A. Junction to Athens, with jurisdiction over Macon terminals; office at Macon, Ga. Southwestern division, consisting of lines from Marion to Montgomery, Forth Valley to Parry, Smithville to Lockhart, Gulbert Junction to Fort Gaines, and Eufaula to Ozark; office at Macon, Ga. Columbus division, consisting of lines from Columbus to Birmingham, Henry Ellen to Margaret, Columbus to Fort Valley, Columbus to Americus, Columbus to Andalusia, Columbus to Greenville, and East Alabama Junction to Roanoke; office at Columbus, Ga.

Chicago, Indiana & Southern.—H. A. Zeisel, Superintendent at Hammond, Ind., has been appointed General Superintendent, with office at Chicago, Ill.

Cincinnati, New Orleans & Texas Pacific.—W. S. Melton has been appointed Superintendent of Telegraph of this road and of the Alabama Great Southern, with office at Chattanooga, Tenn., succeeding G. L. Lang, resigned.

Lexington & Eastern.—W. A. McDowell, Assistant to the General Manager, has been appointed General Manager, with office at Lexington, Ky., succeeding J. R. Barr, deceased.

Pere Marquette.—Theodore Ensel, private Secretary to the General Manager, has been appointed Superintendent at Grand Rapids, Mich., succeeding P. N. Place, resigned, to go into other business.

Rio Grande Western.—D. A. Campbell, Trainmaster at Salt Lake City, has been appointed to the new office of Assistant Superintendent at that place.

St. Louis & San Francisco.—H. H. Brown, Superintendent at Memphis, Tenn., has been appointed Superintendent at Springfield, Mo. A. D. Lightner, General Agent at Birmingham, Ala., succeeds Mr. Brown.

Southern.—A. M. Smith, Assistant Superintendent at Columbus, S. C., has been appointed Assistant Superintendent of the Charleston division, with headquarters at Rockhill, S. C., in charge of the road between Marion, Rockhill and Camden, and between Camden and Kingville. R. W. Edwards succeeds Mr. Smith at Columbia.

Traffic Officers.

El Paso & Southwestern.—T. Shumacker has been appointed Traffic Manager, with office in New York City.

New York Central & Hudson River.—J. M. Brennan, Assistant to the General Passenger Agent of the West Shore Railroad, has resigned to become General Freight and Passenger Agent of the Tampa Bay & West Coast Navigation Co., with office at Tampa, Fla.

Engineering and Rolling Stock Officers.

Atchison, Topeka & Santa Fe.—W. B. Storey, Chief Engineer of the Atchison, Topeka & Santa Fe Railroad, has been appointed Chief Engineer of the Atchison, Topeka & Santa Fe System, which includes also the A., T. & S. F. Coast Lines, with office at Chicago. C. A. Morse, Acting Chief Engineer of the Coast Lines, succeeds Mr. Storey at Topeka, Kan.

Buffalo & Susquehanna.—P. F. Dreyfus, General Foreman at Toledo, Ohio, of the Pennsylvania Lines West, has been appointed Superintendent of Motive Power of the B. & S., with office at Gale-

ton, Pa., effective Sept. 1, succeeding to the duties heretofore performed by C. R. Williams, Master Mechanic, who has resigned and whose office has been abolished.

Chicago, Burlington & Quincy.—J. Dietrich, Master Mechanic at Lincoln, Neb., has been appointed to the new office of Assistant Superintendent of Motive Power, with office at Lincoln, Neb. G. C. Johnson, Master Mechanic at Sheridan, Wyo., succeeds Mr. Dietrich. F. E. Kennedy, Master Mechanic at McCook, Neb., succeeds Mr. Johnson.

Chicago, Rock Island & Pacific.—W. J. Tollerton, Master Mechanic of the Oregon Short Line at Pocatello, Idaho, has been appointed Superintendent of Motive Power, at Topeka, Kan., of the C., R. I. & P., succeeding Thomas Roope, resigned, to go to the C., B. & Q.

Colorado Midland.—W. J. Schlacks, Superintendent of Machinery, has resigned to go into other business.

Lehigh & New England.—R. L. Wyman, general foreman of the Delaware, Lackawanna & Western at Utica, N. Y., has been appointed Master Mechanic of the Lehigh & New England, with office at Pen Argyl, Pa.

Missouri Pacific.—M. J. McGaw, Master Mechanic at Fort Scott, Kan., has been appointed Master Mechanic at St. Louis, Mo., succeeding L. Bartlett, resigned. M. C. Walsh succeeds Mr. McGaw.

Oregon Short Line.—See Chicago, Rock Island & Pacific.

LOCOMOTIVE BUILDING.

The Great Northern has ordered 75 locomotives from the Baldwin Works.

The Northern Pacific has ordered 90 locomotives from the American Locomotive Co.

The Lehigh Valley has ordered five Atlantic (4-4-2) locomotives from the American Locomotive Co.

The Grand Trunk has ordered some electric locomotives from the Westinghouse Electric & Manufacturing Co. These locomotives are intended for the operation of traffic through St. Clair tunnel.

The Morelia & Tacambaro, reported in our issue of Aug. 24, has having ordered three locomotives, will shortly be in the market for seven additional locomotives. Address Edson J. Chamberlin, President, care of A. J. Peyton & Co., Trinity Building, New York.

The East Broad Top is having one 3-ft. gage simple locomotive built at the Baldwin Works. The general dimensions are as follows:

Weight, total	80,000 lbs.
Weight, on drivers	60,000 lbs.
Diameter of drivers	48 in.
Cylinders	16 in. x 20 in.
Boiler, type	Straight top
" working steam pressure	160 lbs.
" number of tubes	152
" material of tubes	Shelby seamless cold drawn steel
" diameter of tubes	2 in.
" length of tubes	11 ft. 9½ in.
Firebox, length	83 7-16 in.
" width	23⅜ in.
" grate area	13.6 sq. ft.
Tank capacity	2,500 gals.

Evans Vacuum brakes will be used on driving and tender wheels.

The Somerset Railway Co. has ordered two eight-wheel and two ten-wheel simple locomotives from the American Locomotive Company for October, 1906, and March, 1907, delivery. The specifications are as follows:

General Dimensions.

	8-wheel.	10-wheel.
Type of locomotive		
Weight, total	98,000 lbs.	115,000 lbs.
Weight on drivers	61,500 lbs.	87,500 lbs.
Diameter of drivers	63 in.	55-in.
Cylinders	17 in. x 24 in.	18 in. x 24 in.
Boiler, type	Wagon top.	
" working steam pressure	180 lbs.	
" Number of tubes	208	219
" material of tubes	Charcoal iron.	
" diameter of tubes	2 in.	
" length of tubes	11 ft. 8½ in.	13 ft.
Firebox, length	102 in.	102 in.
" width	33½ in.	33½ in.
" grate area	18 sq. ft.	23.7 sq.ft.
Total heating surface	1,400 sq. ft.	1,620 sq. ft.
Tank capacity	3,200 gals.	3,800 gals.
Coal capacity	5 tons.	6 tons.

Special equipment.

Axles	Hammered steel.
Boiler lagging	Asbestos.
Brakes	Westinghouse.
Brake-beams	Sterlingworth
Brake-shoes	Perfecto.
Couplers	Tower.
Heating equipment	Consolidated.
Injectors	Hancock.
Lubricators	Nathan Triple Sight-feed.
Piston rod packing	U. S. Metallic Packing Co.
Valve rod packing	U. S. Metallic Packing Co.
Sanding devices	Leach.
Springs	Standard.
Steam gages	American Loco. Co.
Tires	Midvale.

CAR BUILDING.

The New York Central is asking bids on several thousand box cars.

The Missouri Pacific has ordered 500 gondola cars from the American Car & Foundry Co.

The Northern Pacific, it is reported, is about to close contracts for a large number of freight cars.

The Union Pacific, it is reported, is asking bids on 600 refrigerator cars with steel underframes.

The Huntington & Broad Top Mountain has ordered 200 hopper coal cars from the Pressed Steel Car Co.

The New York Central Lines, it is reported, have just placed an order for 5,000 grain cars with the Pullman Co.

The Canadian Northern has ordered 100 box cars of 60,000 lbs. capacity, six coaches and five mail and express cars from the Crossen Co.

The Atchison, Topeka & Santa Fe, it is reported, is in the market for 2,000 refrigerator cars, and has ordered 300 passenger coaches.

The Detroit, Toledo & Ironton, as reported in our issue of August 24, denies being in the market for any new equipment at this time.

The Quebec Railway, Light & Power Co., Quebec, Que., has ordered 25 flat cars of 40,000 lbs. capacity from the Rathburn Co. These cars will weigh 18,000 lbs. and measure 34 ft. long.

The Morelia & Tacambaro will shortly be in the market for 600 freight cars, 15 passenger coaches and three baggage cars. Address Edson J. Chamberlin, care of A. J. Peyton & Co., Trinity Building, New York.

The Lehigh Valley has ordered 1,000 coal cars of 100,000 lbs. capacity, 500 gondola cars of 80,000 lbs. capacity, 500 gondolas of 60,000 lbs. capacity, 102 produce cars of 60,000 lbs. capacity, 25 automobile cars, 20 express and baggage cars and one dining car.

The Atlantic Coast Line has ordered 60 Hart convertible cars of 80,000 lbs. capacity from the Rodger Ballast Car Co. for November delivery. These cars will weigh 38,000 lbs. and will measure 36 ft. long over end sills; 10 ft. 2⅜ in. wide, 8 ft. 2¼ in. high, and the bodies and underframe will be of wood. The special equipment includes: Simplex truck bolsters, cast steel body bolsters, Monarch solid brake-shoes, Westinghouse brakes, Tower couplers, Thornburgh tandem draft gear, and 33-in. chilled cast-iron wheels.

The Mexican Central, it is reported, has ordered 750 steel underframe box cars of 80,000 lbs. capacity, 150 steel underframe stock cars of 60,000 lbs. capacity, 100 steel underframe flat cars of 80,000 lbs. capacity, and 180 steel underframe oil tank cars of 9,800 gallons capacity from the Standard Steel Car Company. Delivery for the above equipment will commence in January, 1907, and 20 cars will be delivered daily. The company has also ordered 11 express cars and four combination mail and express cars from the Barney & Smith Co., delivery to commence in November, 1906.

The Youngstown & Southern has ordered two interurban passenger, two interurban passenger and baggage and one interurban freight and express car from the Niles Car & Manufacturing Co., for November delivery. All cars will be 40 ft. 6 in. long, 8 ft. 9 in. wide and 12 ft. 9 in. high, inside measurements. The special equipment for all includes:

Bolsters	Baldwin
Brake-beams	Baldwin
Brakes	Westinghouse
Couplers	Van Dorn
Curtain material	Pantasote
Paint	Pullman
Roofs	Empire
Trucks	Baldwin

RAILROAD STRUCTURES.

BATON ROUGE, LA.—The Texas & Pacific has bought land at Baton Rouge Junction as a site for repair shops.

BATTLE CREEK, MICH.—The Grand Trunk, it is said, will shortly begin work on extensive new shops.

BURNSIDE, ILL.—The Illinois Central, it is said, has commenced work on new car shops. The main building is to be 120 ft. wide by 574 ft. long.

CHATTANOOGA, TENN.—The Chattanooga Railway Co. has given a contract to the West Construction Co. for putting up new car shops at a cost of $50,000. The company is also planning to put up car barns near the shops.

FARMINGTON, ME.—A contract has been given to Coomb & Gibbs, of Lewiston, for putting up a new passenger station for the Sandy River Railroad. The building is to be of granite, 51 ft. by 60 ft.

FT. SCOTT, KAN.—The St. Louis & San Francisco recently opened bids for putting up a large roundhouse here.

HALIFAX, N. S.—The Intercolonial has plans ready for putting up a large roundhouse here this fall.

LEWISTON, IDAHO.—McCreary & Willard, of Spokane, Wash., have been given a contract to construct a 700-ft. steel bridge across the Clearwater river here for the Oregon, Washington & Idaho Railway. Twelve hundred tons of steel will be used. Erickson & Peterson, of San Francisco, will furnish the structural material.

LEXINGTON, KY.—Contracts, it is said, are to be let by the Cincinnati, New Orleans & Texas Pacific for putting up a new office building to cost about $50,000.

LOS ANGELES, CAL.—The Pacific Electric Railway Co. has given a contract for, and work is now under way by the Mercereau Bridge Company on a new steel plate girder bridge 200 ft. long with concrete foundations and reinforced concrete floors 8 in. thick. The work will require about 2,000 cubic yards of concrete and 400,000 lbs. of steel. The bridge is to be built on the line of the new cut-off between Los Angeles and Monrovia Junction, at a point where the Southern Pacific crosses Alhambra avenue.

LYNN, MASS.—The Special Commissioners appointed by the Superior Court to consider the matter of abolishing grade crossings of the Boston & Maine in Lynn recommend alterations in the grade at streets that cross the tracks of the B. & M., as follows: Union, Exchange, Washington, Market, Pleasant, Blossom and Shepard and Central square. Silsbee street is to be discontinued and an elevated passageway built for pedestrians. At Pleasant, State, Alley and Blossom streets the street grades will be depressed. The commissioners make no mention of the estimated expense. Of the total expense for abolishing the crossings the commissioners make the following apportionment: Boston & Maine 65 per cent., city of Lynn 10 per cent., with the remaining 25 per cent. to be paid by the state and Boston & Northern Street Railway, the percentage of the latter being fixed in proportion to expense entailed in abolishing grades over which electric cars now pass.

MONTGOMERY, ALA.—The Western of Alabama has plans about completed for putting up new shops at a cost of $75,000.

MONCTON, N. B.—The Intercolonial is to replace the buildings destroyed by fire with new structures as follows: Tool room, brass shop, bolt shop, etc., under one roof, 355 ft. by 44 ft.; machine shop in two bays, 355 ft. by 135 ft.; smith shop, 300 ft. by 75 ft.; engine shop, 375 ft. by 80 ft.; boiler erecting shop, 300 ft. by 50 ft.; bolt shop, 355 ft. by 50 ft.; car repair shop, 360 ft. by 100 ft.; passenger car paint shop, 360 ft. by 100 ft.; freight car repair shop, 360 ft. by 132 ft.; planing mill and carpenter shop, 300 ft. by 88 ft.; storehouse and office building, 200 ft. by 55 ft., and several accessory buildings.

NASHVILLE, TENN.—The Nashville Railway & Light Co., according to local reports, proposes to use $1,500,000 for immediate improvements, including rebuilding and extending the transfer station, building conduits, buying new cars and installing new machinery, the latter to cost about $500,000.

SACRAMENTO, CAL.—The Southern Pacific is considering plans for a new passenger station here to have a frontage of 500 ft. and to cost about $200,000.

The Southern Pacific is planning to replace the bridge over Sacramento river with a new double-deck steel bridge to carry two tracks and a highway. The new bridge, which is to be about 950 ft. long, is to have a draw span a trifle longer than the present one. The upper deck is to be used for the highway.

SPOKANE, WASH.—A contract has been let to McCreary & Willard, of Spokane, at $250,000, to build steel bridges for the Oregon Railway & Navigation Company. About 3,000 tons of steel will be required. The work includes the following: Steel bridge, 270 ft., across Hood river; 710 ft. across Sandy river, 420 ft. across Umatilla river, 300 ft. at Pendleton, 450 ft. across Des Chutes river, 175 ft. across Walla Walla river, 100 ft. across Burnt river. The structural steel will be delivered by a San Francisco firm. Work is to begin at once.

Estimates made by Commissioner Roy of the new bridges required in this city, to cost between $350,000 and $400,000, are as follows: Mission avenue bridge, $45,000; two bridges over the north and central channels at Howard street, $70,000; bridge over south channel at Howard street, $20,000; Havermale Island bridge, $20,000; bridge over Latah creek, $20,000; Washington street bridge, $35,000. Viaducts at Washington and Division streets are estimated at $328,000, of which the city's share will be $110,000.

Henry M. Richards and residents in the western part of Spokane have petitioned the city council to build a bridge across the Spokane river, to cost $10,000.

SUPERIOR, WIS.—Local reports state that the Great Northern is planning to put up a car building plant here, to give employment to about 1,000 men. The company's shops at St. Paul, St. Cloud and Branesville are overcrowded with work.

WATERTOWN, N. Y.—A contract is reported let by the New York Central to Clinton Hodges & Co. for putting up a new freight house here to cost about $70,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ADIRONDACK & ST. LAWRENCE.—The State Board of Railroad Commissioners has granted permission to this company to build a line from De Kalb Junction, southeast, to Hermon, in St. Lawrence County, 3.60 miles. (May 4, p. 136.)

BEAUMONT & GREAT NORTHERN.—Twenty miles of the main line of this road in Texas has been completed and will be ready for operation early next month. Work on the remaining 17 miles from Onalaska is to be pushed to completion as rapidly as possible, so that the line will be opened from Trinity to Livingston early next spring.

CAMPTON RAILROAD.—This company has completed a narrow gage line from a junction with the Lexington & Eastern at Natural Bridge, Ky., to Campton, in Wolf County. The road was built to reach timber lands.

CANADIAN PACIFIC.—A contract for grading a three-mile section near Saskatoon, Sask., has been let to John Davie of that place.

CENTRAL OF GEORGIA.—The last annual report of this company shows that a length of 10½ miles has been aded to the spur at Henry Ellen to reach the company's coal property to Cahaba, St. Clair, Ala.

The Greenville & Newnan, which is to be 23.73 miles long, from Greenville, Ga., to a point on the Chattanooga district between Sharpsburg and Newnan, Ga., called Raynan, for which contract was let in September, 1905, is to be completed by November of this year.

The line from Columbus to Greenville, Ga., 49.51 miles, was widened from 3 ft. to standard gage during the year. About two miles of trestles are being eliminated by fillings, and improvements have been made both in alinement and grades.

Same grade reducing trains have been made on the Chattanooga district during the year. A number of new side and spur-tracks aggregating 13.55 miles were laid and a number of others extended aggregating 5.23, making a total of 18.78 of side and spur tracks constructed during the year.

Extensive terminal improvements are nearly finished at Albany and Savannah. These include enlargement of the yards and the erection of a 2,500 ton coal bin at Albany, and a receiving yard at Savannah. The work at Albany has thus far cost $33,312, and that at Savannah $54,591.

At Athens, Ga., about $15,000 has been spent on the new yard, including additional bulk tracks and a combined passenger and freight station, which is the cost of about one-fifth of the work. The company is also providing new passing and warehouse tracks on all the divisions of the road.

CHICAGO, NEW WASHINGTON & BUCYRUS.—An officer writes that the prospects of building this road are good, and that the motive power will be either electricity or gasolene. The proposed route is from Chicago, Ohio, through New Washington and Sulphur Springs to Bucyrus. E. Z. Williams, Chicago, Ohio, is President.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—An officer writes that the grading is being done by this company for double-track between Flatrock, Ky., and Helenwood, Tenn., 30 miles. This is the only work of this character contemplated at present.

CITY & ELM GROVE.—This company has been incorporated in West Virginia, with capital of $2,000,000 and headquarters at Wheeling. The incorporators are: I. M. Noles, J. J. P. O'Brien, F. A. O'Brien, C. Hartsmann and J. F. Ebling, all of Wheeling.

COOS BAY, ROSEBURG & EASTERN.—The contract for grading the first 20 miles of the Drain-Coos Bay extension has been let to the C. E. Loss Co., of San Francisco, and work is to begin immediately. The work will be rapidly pushed, it being the intention to have the entire road in operation by next summer.

DETROIT, TOLEDO & IRONTON.—Surveys and estimates have been completed for building a line from Ashland, Ky., up Hoods creek, East fork and down Bear creek to the Big Sandy river, thence up that river to the mouth of Shelby creek, 118 miles. From this point a branch is to be built up Long Fork creek, 23 miles, to the coal properties bought by Eugene Zimmerman, President of the D. T. & I., and associates. The Ashland & Ironton Bridge Co., controlled by them, is now building a bridge over the Ohio river at Ashland. An additional branch is to be built up Shelby creek, 20 miles, while a third branch will be built up Beaver creek to the Beaver creek coal fields, an additional 36 miles. For a part of the distance the line will parallel the newly completed extension of the Chesapeake & Ohio up the Big Sandy river. These new lines

will open up some of the best coal fields in Kentucky. J. F. Prindivle, Paintsville, Ky., is the Engineer in charge.

Front Royal, Rappahannock & Tidewater.—Incorporated in Virginia with $50,000 capital to build a line from Front Royal, Warren County, via Charlottesville to Richmond, 150 miles, through the counties of Warren, Rappahannock, Madison, Greene, Albemarle, Culpeper, Orange, Louisa, Fluvanna, Goochland, Hanover, Henrico, Spottsylvania and Fauquier. S. R. Miller is the president. It is the purpose of the company to build the road as soon as possible. The incorporators are: E. H. Jackson, Front Royal; S. R. Miller, Front Royal; John I. Miller, Washington, Va.; W. J. Browning, Flint Hill, Va.; William L. Jones, Flint Hill, Va.; Hugh E. Naylor, Front Royal; W. L. Keyser.

Greenville & Newnan.—See Central of Georgia.

Indian Creek & Pound River.—This company, operating 10 miles of road in Virginia, has decided to extend its line from Pound, Va., into Dickenson County, about 20 miles, to a valuable coal and timber section.

Lehigh Valley.—This company, it is reported, is negotiating for the electrification of its branch line from Tunkhannock, Pa., to Montrose, and for building an extension of the line from the latter point to Binghamton.

Lexington & Eastern.—Surveys have been completed for an extension from Jackson, Ky., southeast to Hazard, 25 miles. It is announced that work is to be started at once. From Hazard the line is to be eventually extended into the coal fields of Letcher County, an additional 25 miles.

Liberty-White.—An officer writes that this company, which operates a line from McComb, Miss., west to Liberty, 24.2 miles, has completed the construction of 10 miles from the eastern terminus to Hahnesville, and that surveys are now being made for a continuation of the line east to Columbia, Miss. Surveys have not yet been completed for the extension of the road from the present western terminus at Liberty to Natchez.

Manila Railway.—Announcement is made in London that negotiations are being made with the United States government to take over the Manila Railway in the Philippine Islands with a view to having it transferred by the English owners to an American corporation.

New York, New Haven & Hartford.—A contract is reported let by this company to J. K. Ryan, of New York, at about $400,000 for grading work in connection with the proposed abolishment of the Dudley Street Boston grade crossing on the Midland division.

Norfolk & Washington Air Line.—A. B. Linderman, Philadelphia, Pa., President of this company, says that a contract for the construction and equipment of this proposed line from Washington, D. C., to Esperanza, Md., 64 miles, has been let to D. E. Baxter & Co., Inc., New York. The entire line is to be laid with 70-lb. rails.

Oaxaca & Oriente.—According to reports from the City of Mexico, this road is to be extended to Tlacolula and to the ruins of Mitla. It was also decided to extend the line to the isthmus of Tehauntepec, where connection is to be made with the National Tehauntepec. Such a line in connection with the Mexican Southern will furnish a new direct route from Mexico City to southeastern Mexico.

Pennsylvania.—A contract has been given to the Drake & Stratton Co., of Philadelphia, for work on the last section of the terminal improvements of the Philadelphia, Baltimore & Washington at Washington, D. C. Two tracks of the new elevated line from the Navy Yard tunnel to B street are now in use, and the old main tracks have been taken up.

Philadelphia & Reading.—This company has given a contract to Smith & Campion, of Mahanoy City, for grading and masonry work on a second track on the Catawissa branch between Quakake and Hazle Junction. The double-tracking of this part of the line has become necessary to relieve the congestion of freight traffic between Hawks and Lofty. It is also expected that Ryan's tunnel, which is 500 ft. long, is to be widened for a double-track, and the top of the tunnel may be removed, making an open cut.

Philadelphia, Baltimore & Washington.—See Pennsylvania.

Southern Pacific.—California papers report that this company has decided to abandon its through passenger and freight service to Portland, Oregon, over the steep grades of the Siskiayou Mountains. It has bought the California Northeastern Railway, a 40 mile line extending north of Weed, with a right of way through to Klamath Falls. The Harriman engineers are to rush this lumber line to completion and connect it at Klamath Falls with the Oregon & Eastern Railway, now being built from Natron, Ore., south. With the joining of these two lines, all through traffic from San Francisco and points south of Weed will go to Portland and north via Klamath Falls. The present Mount Shasta line will be maintained for local service. The Klamath route will give an easy grade and light curves over the mountains.

Western Pacific.—This company has completed 34 miles of track southeasterly and westerly from Salt Lake City. Towards the west grading is progressing rapidly, on level ground, and track is being laid at the rate of about a mile a day.

RAILROAD CORPORATION NEWS.

Baltimore & Ohio.—It is reported that this company is negotiating for the purchase of the Coal & Coke Railroad, which owns about 180 miles of road from Elkins, W. Va., to Charleston. It has $10,000,000 capital stock, and $8,950,000 first mortgage 5 per cent. bonds of 1919 outstanding.

Canadian Pacific.—During July, 608,961 acres of land were sold for $2,872,699, the average price being $4.71 per acre; as compared with $5.18 per acre during the corresponding month in 1905, when 59,957 acres were sold for $309,916. The larger part of the land sales were in the Province of Alberta.

Canton-Akron Consolidated Railway.—This company has been incorporated in Ohio with a nominal capital of $10,000, which may be increased to $2,500,000, for the purpose of merging the properties which the Northern Ohio Traction & Light Co. has agreed to buy from Tucker, Anthony & Co., Boston. These include the Canton-Akron Consolidated Railway Co., operating 55 miles of electric lines; the Tuscarawas Traction Co., operating 14 miles, and the Canton-New Philadelphia Railway Co., operating 22.6 miles.

Chicago, Milwaukee & St. Paul.—With the incorporation of the Chicago, Milwaukee & St. Paul of South Dakota, the corporate companies of the St. Paul's Pacific extension are three in number, the other two are the C., M. & St. P. of Montana, and the C., M. & St. P. of Washington, the last named being the new name of the company which was the first of the three to be incorporated.

Coal & Coke.—See Baltimore & Ohio.

Grand Trunk Pacific.—The company has made an agreement with the city of Edmonton, Alberta, under which in consideration of a bonus of $100,000 in cash or debentures, exemption from taxation for five years and a fixed assessment for 20 succeeding years at the present assessed value, the company agrees to make Edmonton the chief divisional point on the main line between Winnipeg and the Pacific coast and to maintain shops there.

Louisville & Nashville.—The gross earnings for the year ended June 30, 1906, were $43,008,996, an increase of $4,491,925; net earnings, $12,075,532, an increase of $48,482. The surplus, after charges, 6 per cent. dividend on the $60,000,000 outstanding capital stock, and the L. & N.'s proportion of the lease of the Georgia Railroad was $2,895,469, a decrease of $435,357.

Missouri, Kansas & Texas.—This company has again applied to the Texas Railroad Commission for permission to issue $25,000,000 mortgage bonds on its lines in Texas. The present application is a modification of the original application which was refused a few months ago.

Missouri Pacific.—The $3,828,000 7 per cent. third mortgage bonds maturing Nov. 1, 1906, are to be extended for 32 years at 4 per cent.

Toledo, Ann Arbor & Detroit (Electric).—Willis Baldwin, Monroe, Mich., and R. H. Burgonn, Fremont, Ohio, have been appointed Receivers for this partially built road between Toledo, Ohio, and Ann Arbor, Mich., on the petition of the contractors who built a power house for the company at Petersburg, Mich.

Troy & New England (Electric).—Action has been brought in the New York State Supreme Court to foreclose the first mortgage securing $160,000 5 per cent. bonds of 1945, on which the interest due Feb. 1, 1906, was defaulted. The road runs from Albia, N. Y., to Averill Park. It has 10 miles of track, including sidings. The company has been in the hands of a Receiver since last January.

Wadley Southern.—This company, which is a consolidation of the Stillmore Air Line and the Wadley & Mt. Vernon, is to mortgage its property to the Guarantee Trust Company, New York, Trustee, securing $1,000,000 first mortgage 5 per cent. 20 year bonds, dated July 4, 1906, and redeemable at 105 and interest on any interest date. Of this amount, $485,000 is issuable at once and, of the remainder, $315,000 is reserved to retire at face value the outstanding bonds of the Wadley & Mt. Vernon, while $200,000 is to be hereafter issued for improvements, betterments and additions.